C-58-205-000/MJ-000

THIS PUBLICATION HAS BEEN ADOPTED BY THE CF AND IS ISSUED ON AUTHORITY OF THE CHIEF OF THE DEFENCE STAFF.
CETTE PUBLICATION A ETE ADOPTEE PAR LES FC ET EST PUBLIEE AVEC L,AUTORISATION DU CHEF DE L,ETAT-MAJOR DE LA DEFENCE.

ESL
INCORPORATED
495 JAVA DRIVE • SUNNYVALE • CALIFORNIA

Instruction Manual

ESL-IM165

6 July 1977

INSTALLATION, OPERATION AND ALIGNMENT MANUAL

AN/MRD-501 (V)

MOBILE RADIO DIRECTION FINDING SYSTEM

ESL INCORPORATED
Electromagnetic Systems Laboratories
Sunnyvale, California

Instruction Manual
ESL-IM165

6 July 1977

INSTALLATION, OPERATION

AND

ALIGNMENT MANUAL

AN/MRD-501(V)

MOBILE RADIO DIRECTION FINDING SYSTEM

Prepared Under Contract No. 2PJ3655415

This Document Consists of 91 Pages

TIMBERWOLF

INSTALLATION, OPERATION
AND
ALIGNMENT MANUAL

AN/MRD-501(V)

MOBILE RADIO DIRECTION FINDING SYSTEM

6 July 1977

TABLE OF CONTENTS

Section		Page
1.	INTRODUCTION	1-1
1.1	Scope	1-1
1.2	Description	1-1
1.3	Technical Specifications	1-14
2.	INTRODUCTION	2-1
2.1	General	2-1
2.2	Installation	2-1
3.	OPERATING INSTRUCTIONS	3-1
3.1	Turn On and Initialization	3-1
3.2	Controls and Indicators	3-3
3.3	BITE Test	3-11
4.	ALIGNMENT	4-1
4.1	Vector Display Alignment	4-1
4.2	Spectrum Display Alignment	4-1
4.3	DF Antenna Alignment	4-3
4.4	Demultiplexer Boards A1 and A2 Alignment	4-4
4.4.1	Bit Sync Board A1 Adjustments	4-4
4.4.2	Demodulator Board A2 Adjustments	4-5
APPENDIX A	Antenna Assembly Parts List and Schematic	A-1
APPENDIX B	Power Supply Assembly Parts List and Schematic	B-1
APPENDIX C	DF Chassis Assembly Parts List and Schematic	C-1
APPENDIX D	Cable Assembly Parts List	D-1

ILLUSTRATIONS

Figure		Page
1-1	AN/MRD-501(V) Mobile Direction Finding System (Front View)	1-2
1-1(Cont)	AN/MRD-501(V) Mobile Direction Finding System (Back View)	1-3
1-2	Master Control Station LRU Electronic Equipment Assemblies	1-5
1-3	Master Control Station Block Diagram	1-6
1-4	Remote (Slave) Station LRU Electronic Equipment Assemblies	1-7
1-5	Slave Station Block Diagram	1-11
4-1	X-Y Test Pattern	4-2
4-2	Eye Pattern for Test Point J6 of Demultiplexer Circuit Card A2	4-6

ILLUSTRATIONS

Figure		Page
1-1	AN/MRD-501(V) Mobile Direction Finding System (Front View)	1-2
1-1(Cont)	AN/MRD-501(V) Mobile Direction Finding System (Back View)	1-3
1-2	Master Control Station LRU Electronic Equipment Assemblies	1-5
1-3	Master Control Station Block Diagram	1-9
1-4	Remote (Slave) Station LRU Electronic Equipment Assemblies	1-7
1-5	Slave Station Block Diagram	1-11
4-1	X-Y Test Pattern	4-2
4-2	Eye Pattern for Test Point 16 of Demultiplexer Circuit Card A2	4-6

TABLES

Table		Page
1-1	Components Comprising the Master Control Station	1-8
1-2	Components Comprising A Slave Station	1-12
3-1	Receiver Control Unit Controls and Indicator Functions	3-4
3-2	DF Chassis Assembly Front Panel Controls and Indicators	3-10
3-3	Direction Finding Unit Remote Mode Controls and Indicators (DFS-7D)	3-13
3-4	Power Supply Controls and Indicators	3-15

CHAPTER 1

1. INTRODUCTION

1.1 Scope

This manual provides the installation, operation and alignment information for the AN/MRD-501(V) mobile radio direction finding (DF) system. This manual and various appendicies to the manual provide documentation for the DF antenna array, master station power supply, DF chassis assembly and interconnecting cabling.

NOTE

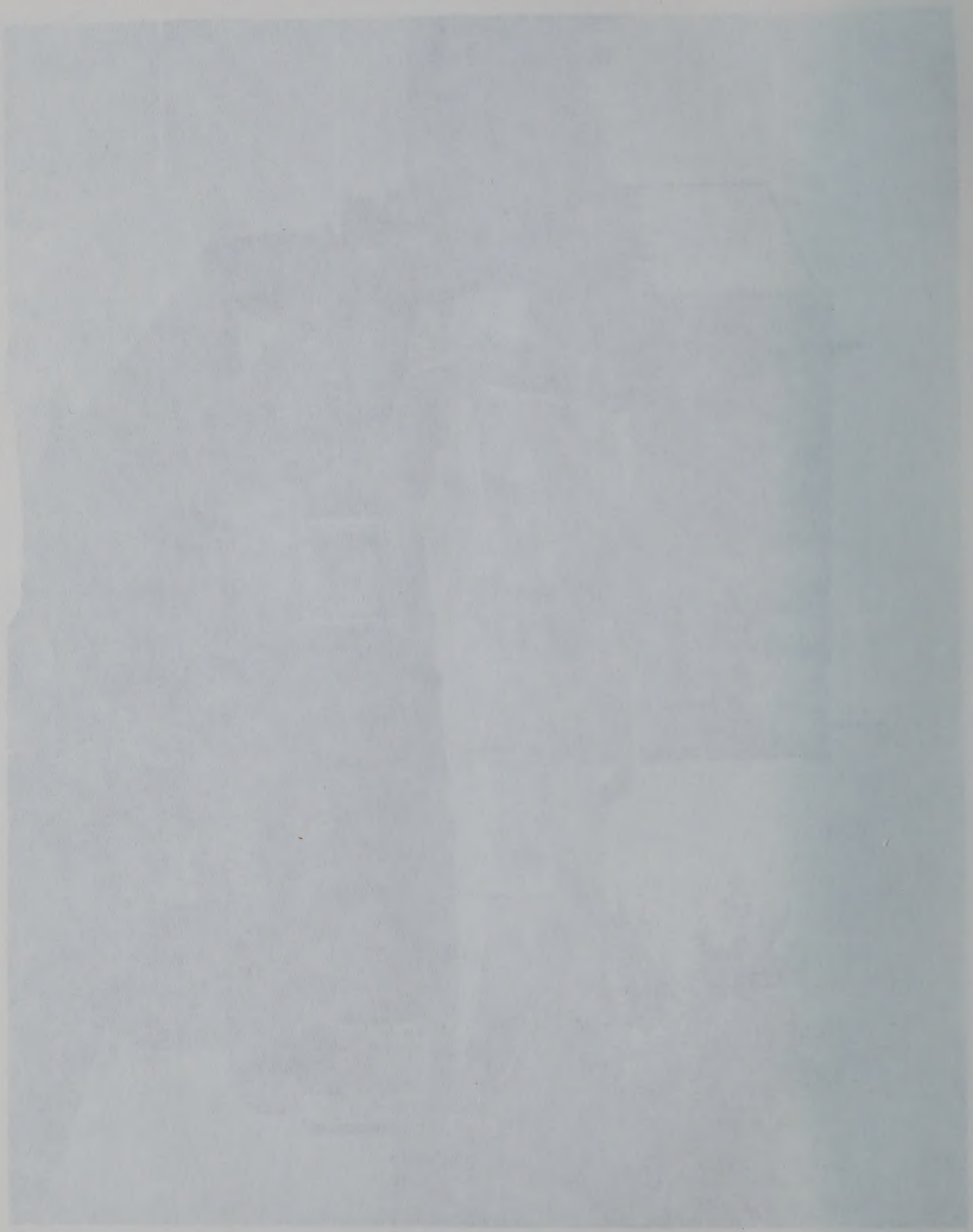
Documentation for the Direction Finding Control Indicator C-5320/GRD-503, the R-5076/UR, VHF receiver, the multiplexer TD-1017A(P)/URR-66(V), the demultiplexer TD-1016A(P)/URR-66(V), and the receiver control unit C-5391/UR are found in their respective manuals.

1.2 Description

The AN/MRD-501(V) mobile DF system, hereafter referred to as the DF system, is a ground based mobile VHF radio frequency DF system used to find the line of bearing and position of target RF emitters.

Figure 1-1. AN/MRD-501(V) Mobile Direction Finding System (Back View). (Continued.)

Figure 1-1. AN/MRD-501(V) Mobile Direction Finding System (Front View).



1.2 -- Continued

The DF system consists of a master control station, nomenclatured the Direction Finder Central AN/MRD-502, and up to four slave (remotely located stations; nomenclatured the Direction Finder Station AN/MRD-503(V). A typical configuration of the DF system without antenna is shown in Figure 1-1. The master station can operate independently or in conjunction with slave station(s) to simultaneously DF a target emitter to locate its position. Digital control data is sent to the slave station(s) through a voice grade communications link consisting of a multiplexer unit and an AN/VRC-46 VHF radio receiver/transmitter. The digital controls are received by the slave stations through an AN/VRC-46 and a demultiplexer unit.

A) MASTER CONTROL STATION (AN/MRD-502)

The master control station electronics, except for the DF antenna, are located in a specially equipped 5/4 ton truck shelter as shown in Figure 1-1. The DF antenna is located separately and mounted on a Model AB-952/GRC-103(V) mast. The LRU equipment units comprising the master control station are illustrated in Figure 1-2. Table 1-1 lists the major components. A block diagram of the master control station is found in Figure 1-3.

B) SLAVE STATION (AN/MRD-503(V))

The slave station, except for the DF antenna, is located in a specially equipped 5/4 ton truck shelter as shown in Figure 1-1. The DF antenna is located separately and mounted on a Model AB-952/GRC-103(V) mast. The equipment comprising the slave station is illustrated in Figure 1-4. Table 1-2 lists the major components. A block diagram of the slave station is found in Figure 1-5.

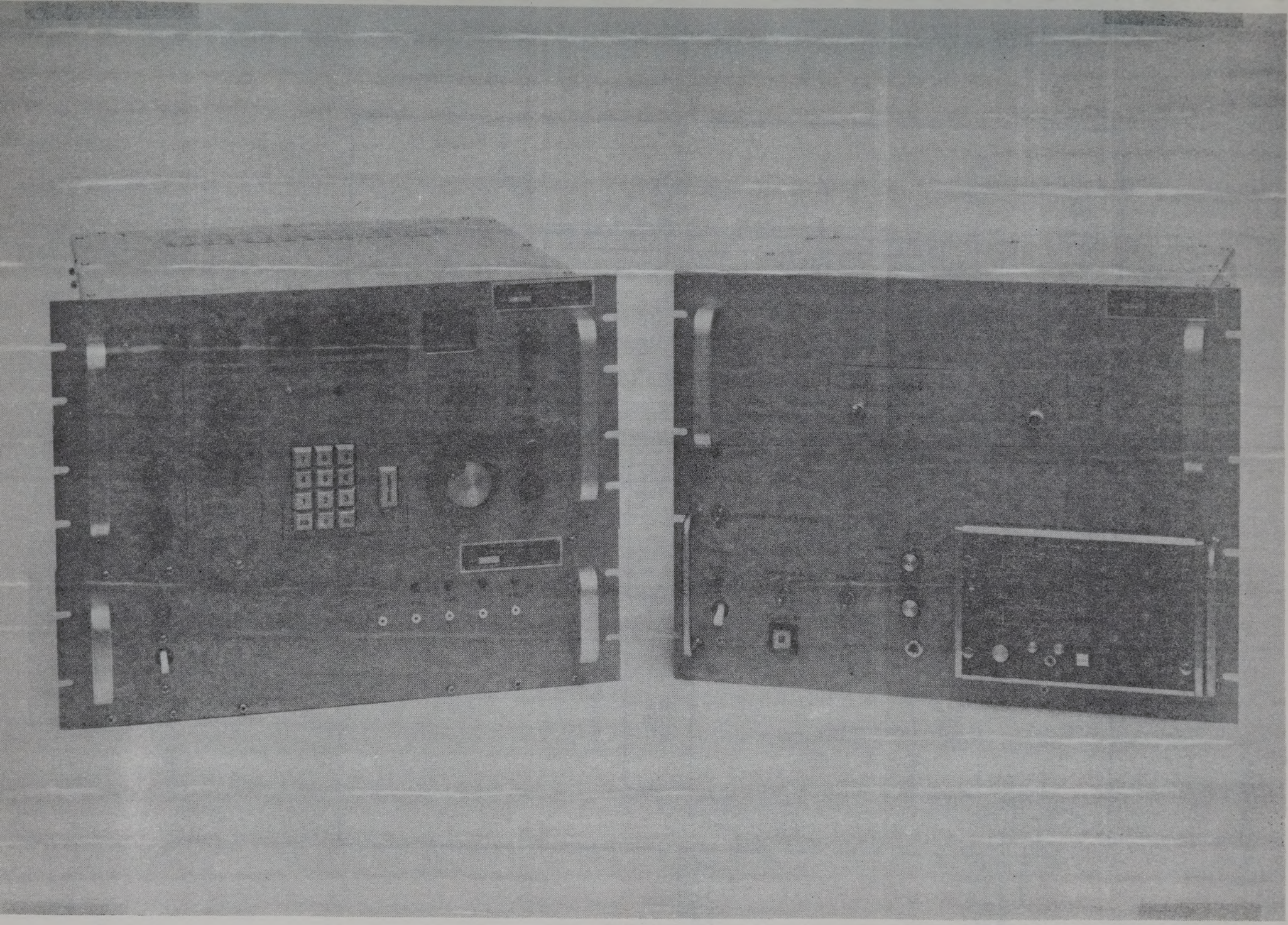


Figure 1-2. Master Control Station LRU Electronic Equipment Assemblies

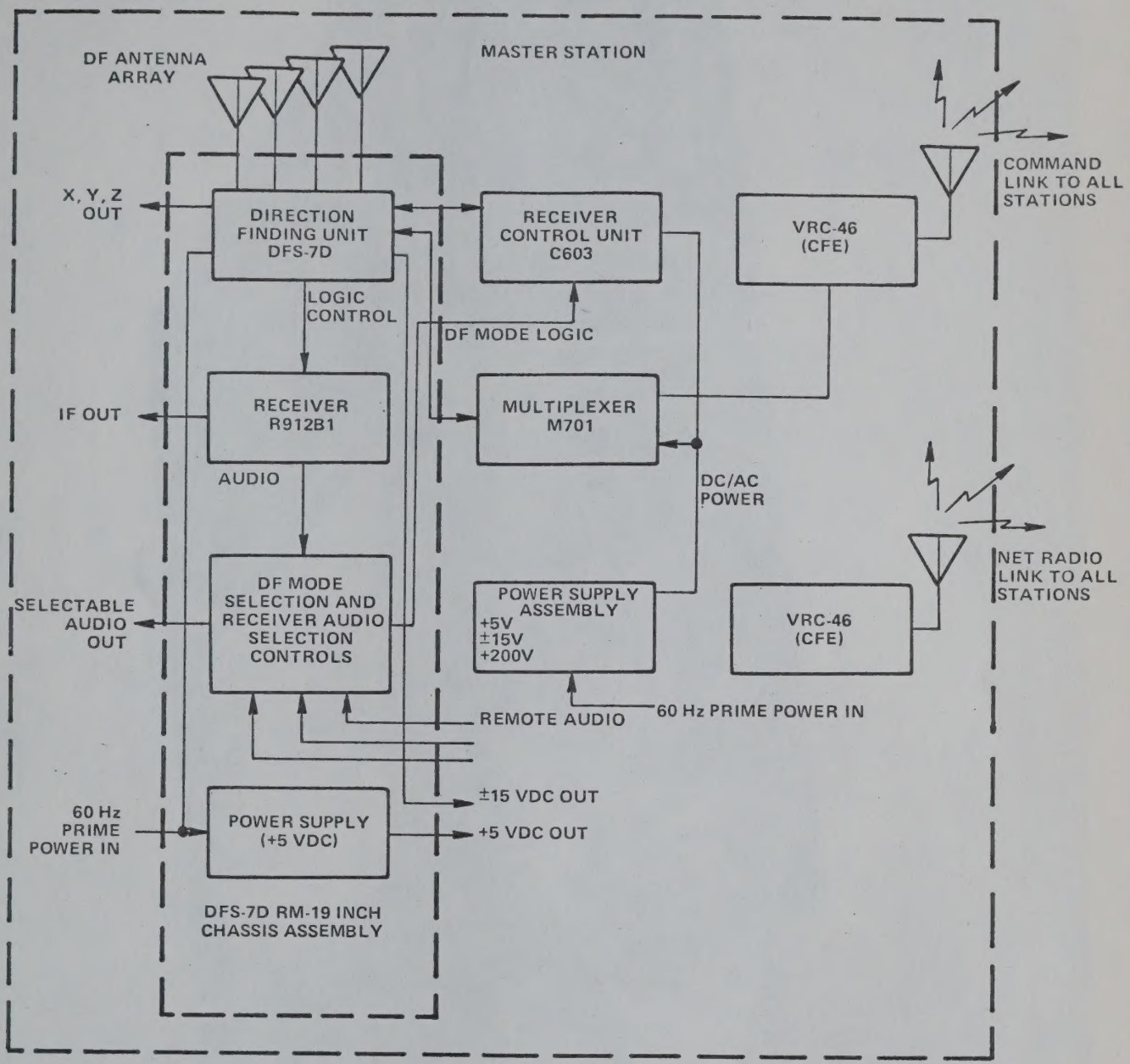


Figure 1-3 Master Control Station Block Diagram

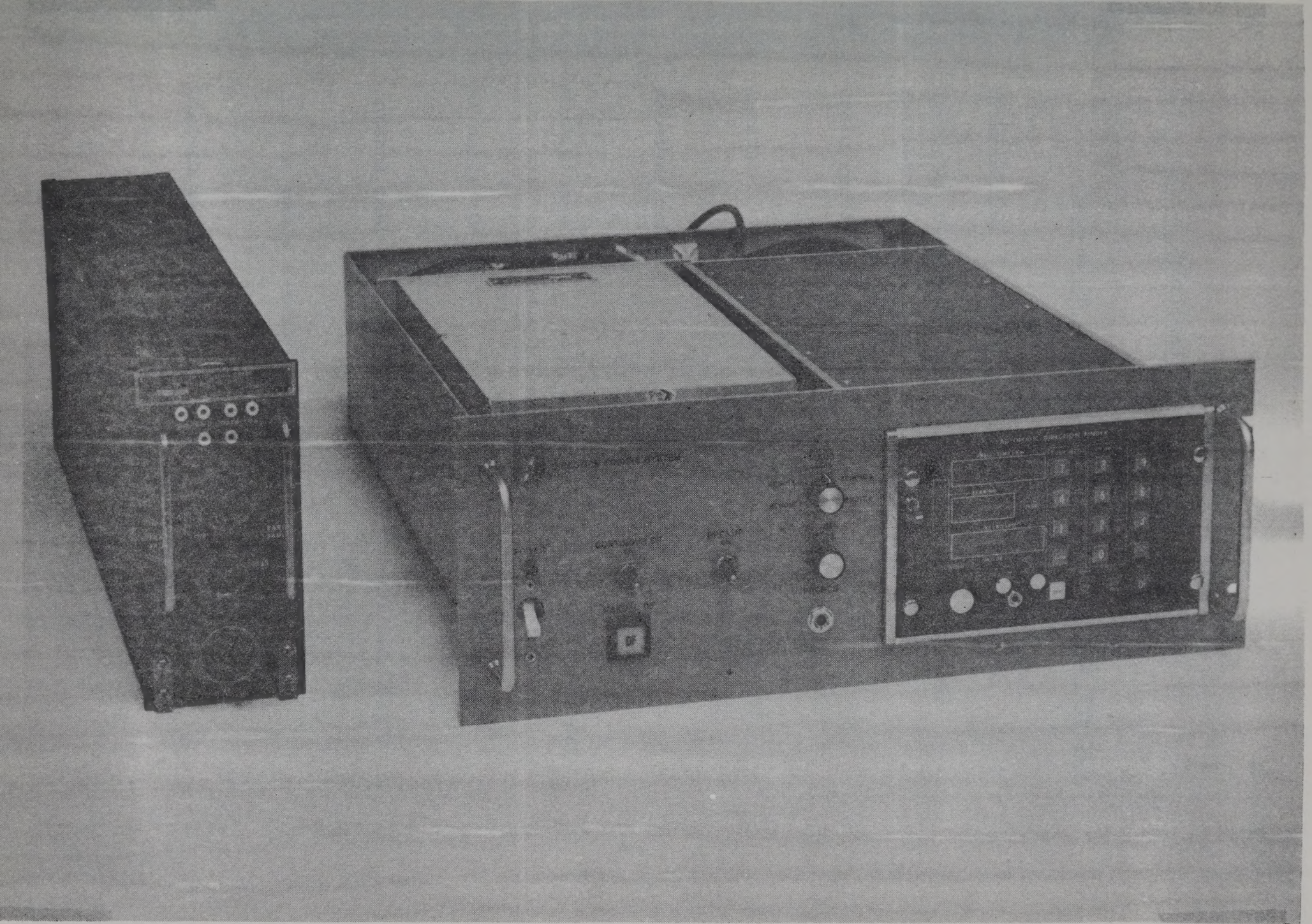


Figure 1-4. Remote (Slave) Station LRU Electronic Equipment Assemblies

1.2 -- Continued

TABLE 1-1

COMPONENTS COMPRISING THE MASTER CONTROL STATION

Description	Qty	Nomenclature (ESL Part #)
Direction finder control indicator[1]	1	C-5320/GRD-503 (10-124485)
Radio receiver[1]	1	R-5076/UR (10-129347)
Antenna	1	AS-5099/GRD-503 (10-128026-1
Receiver control	1	C-5319/UR (10-106513-6)
Multiplexer[2]	1	TD-1017A(P)URR-66(V) (10-108523-4)
RF cable assembly	1	CG-5094/GRD-503 (10-129377)
Antenna mast	1	AB-952/GRC-103(V) (NA)
Digital cable assembly	1	NA (10-130916)
Digital cable assembly	1	NA (10-130909)

1.2 -- Continued

TABLE 1-1 -- Continued

Description	Qty	Nomenclature (ESL Part #)
Digital cable assembly	1	NA (10-130907)
Digital cable assembly[2]	1	NA (10-130907)
Power supply cable assembly	1	NA (10-130908-1)
Power supply cable assembly[2]	1	NA (10-130908-2)
Audio cable assembly	1	NA (10-130918)
Input power cable assembly	2	NA (10-130919)
DF chassis assembly	1	NA (10-124465)
Power supply	1	PP-5273/MRD-502 (10-129035)
Radio set[2]	2	AN/VRC-46 (NA)

1.2 --Continued

TABLE 1-1 --Continued

Description	Qty	Nomenclature (ESL Part #)
Specially equipped 5/4 ton truck	1	(NA)

1 These units are installed in the DF chassis assembly.
2 These items are used if slave stations are operational.

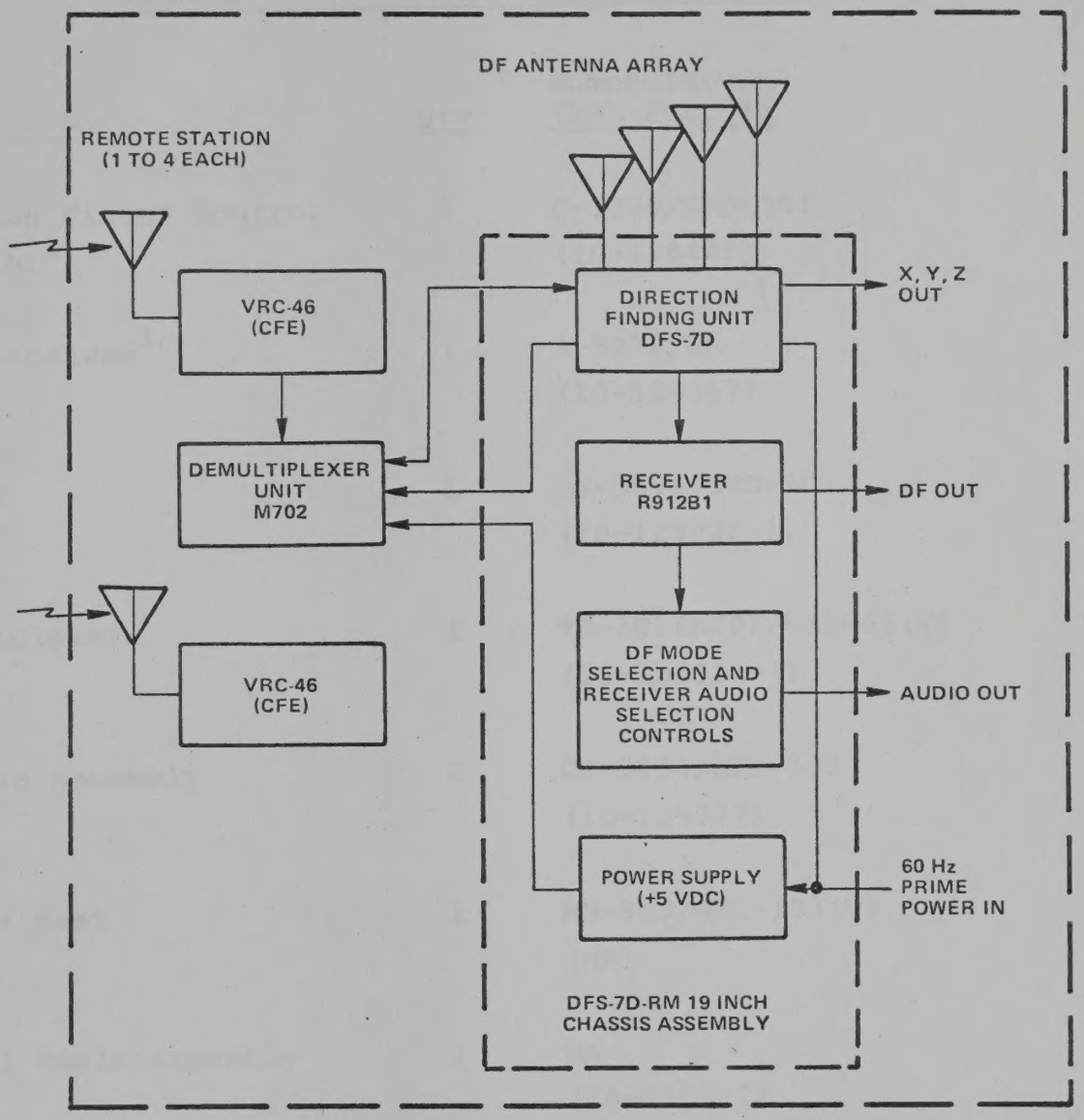
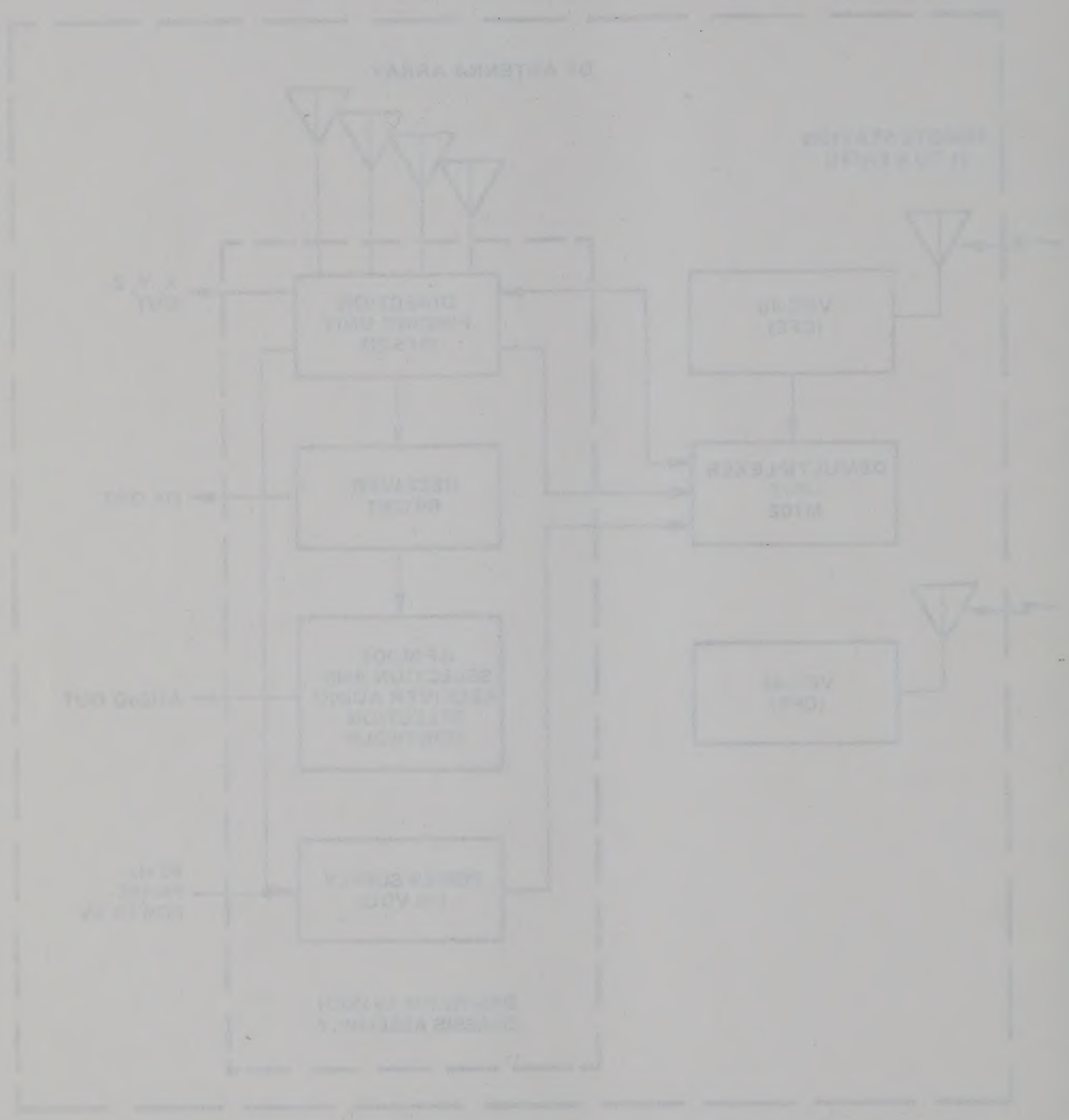


Figure 1-5. Slave Station Block Diagram



1.2 -- Continued

TABLE 1-2
COMPONENTS COMPRISING A SLAVE STATION

Description	Qty	Nomenclature (ESL Part #)
Direction finder control indicator[1]	1	C-5320/GRD-503 (10-124485)
Radio receiver[1]	1	R-5076/UR (10-129347)
Antenna	1	AS-5099/GRD-503 (10-128026-1)
Demultiplexer	1	TD-1016A(P)/URR-66(V) (10-108524-5)
RF cable assembly	1	CG-5094/GRD-503 (10-129377)
Antenna mast	1	AB-952/GRC-103(V) (NA)
Digital cable assembly	1	NA (10-130917)
Power supply cable assembly	1	NA (10-130908-3)

1.2 --Continued

TABLE 1-2 --Continued

Description	Qty	Nomenclature (ESL Part #)
Input power cable assembly	1	NA (10-130919)
DF chassis assembly	1	NA (10-124465)
Radio set	1	AN/VRC-46 (NA)
Specially equipped 5/4 ton truck	1	NA

1 These units are installed in the DF chassis assembly.

1.3 Technical Specifications

Technical specifications for the DF system are given below.

DF Frequency Coverage	20 to 80 MHz
Collection Frequency Coverage	20 to 150 MHz
DF Angular Coverage	360°
Accuracy	2° RMS typical
Sensitivity	Typical values for 1° RMS increase in error are: 2.7μV/meter at 25 MHz and 0.5μV/meter at 75 MHz
Angular Read Out Front Panel	4-digit display; X-Y output capable of driving a standard oscilloscope for a vector display of bearing
Operating Modes	Continuous Single DF
DF Speed	Measurement period less than 1 second

1.3 --Continued

Temperature:	
Non-operating	-50°to +160°F
Operating	
DF Antennas	-50° to +120°F
Electronic Equipment	+32° to +100°F
Power Requirements	110 to 120 vac, 50 to 62 Hz, 1 amp

Size, weight and power requirements for the individual components are given below:

Description	Size	Weight	Power
DF Chassis Assembly (including radio receiver and DF unit)	19"x7"x22" deep	37 #	100 wac
Multiplexer	19"x 7"x12"deep	11 #	Powered from power supply.
Demultiplexer	½ ATR	7 #	Powered from DF chassis assembly
Power Supply	19"x5"x20"	50 #	200 wac
DF Antenna	64"x3'6" square	25#	none

CHAPTER 2

2. INTRODUCTION

2.1 General

The individual components comprising the DF system are normally mounted within the specially equipped 5/4 ton truck shelter except for the DF antenna and antenna mast which are installed externally to the truck shelter.

Interconnecting cabling requirements for the master station are given in Figure FO- 1 . Figure FO -2 gives the interconnecting cabling requirements for the slave station.

2.2 Installation

All equipment is to be installed according to instructions given in the individual equipment manuals except where deviations are noted below. Figures 1-2 and 1-4 illustrate the equipment that is installed in a master control station and slave station respectively.

NOTE

Individual component size, weight and power requirement is given in Paragraph 1-3b.

A) DIRECTION FINDING CONTROL INDICATOR

The DF control indicator is installed in the DF chassis assembly (10-124465) through the front panel of the assembly. Six 6-32 mounting screws inserted through the bottom of the DF chassis assembly hold the DF control indicator in place. Cables

2.2 -- Continued

are connected as shown in the DF chassis assembly wiring diagram, Figure FO -3 . Installation of the DF control indicator is normally performed at the factory.

B) RADIO RECEIVER

The radio receiver is also installed in the DF chassis assembly (10-124465). The receiver is mounted on a special shelf in the DF assembly with an ATR fastener. Cables are connected as shown in the DF chassis assembly wiring diagram, Figure FO -3 . Installation of the radio receiver is normally performed at the factory.

C) DF CHASSIS ASSEMBLY

The DF chassis assembly mounts in a standard 19-inch wide rack. The unit requires six inches of clearance at the back panel for interconnecting cable clearance. Free air flow is required at the back panel and at the top for cooling.

D) RECEIVER CONTROL

The receiver control is used only at the master control station. The unit mounts in a standard 19-inch wide rack. Six inches of clearance is required at the back panel for interconnecting cable clearance.

E) MULTIPLEXER

The multiplexer is used only at the master station. The unit mounts in a standard 19-inch wide rack. Six inches of clearance is required at the back panel for interconnecting cable clearance.

2.2 --Continued

F) POWER SUPPLY

The power supply is used only at the master station. The unit mounts in a standard 19-inch wide rack. Six inches of clearance is required at the back panel for interconnecting cable clearance. Free air flow is required at the top for cooling.

G) DEMULTIPLEXER

The demultiplexer is used only at the slave station. The unit mounts in an ATR-type rack and is cabled from the front.

H) DF ANTENNA AND ANTENNA MAST

The DF antenna mounts directly to the top of the Model AB-952/GRC-103(V) mast. The mast requires non-conducting guy lines above the launching assembly. The guy lines directly connected to the launching assembly can be metal.

The DF antenna array should be adjusted to a minimum height of 30-feet above ground. There is no maximum height restriction. The radio horizon for 35-feet is approximately seven nautical miles. The radio horizon for 50-feet is approximately nine nautical miles.

The AB-952/GRC-103(V) mast is installed according to the equipment manual instructions except for the substitution of non-metallic guy lines above the launching assembly.

2.2 --Continued

For accurate direction finding performance, the DF antenna should be located in a clear area at least 500-feet away from large buildings, hills or other radio frequency obstructions and scatterers. The truck and shelter should be located within five to 10-feet of the base of the antenna mast. Other vehicles should be located either within five to 10-feet of the mast, or 500-feet clear of the mast.

I) RADIO SET

These units are installed according to the appropriate equipment manuals.

J) DF ANTENNA CABLE

The DF antenna cable connects to J2 on the DF chassis assembly back panel and to J1 on the DF antenna. Care must be exercised that no foreign substances (i.e., dirt or water) are allowed to contaminate the connection interfaces. Proper interconnection is critical to the direction finding performance of the DF unit.

The cable clamp on the DF antenna array must be secured around the antenna cable to eliminate tension on the connector. In addition, cable ties must be secured about every six-feet along the antenna mast to evenly distribute the antenna cable weight along the mast length.

K) INTERCONNECTING CABLING

Attach the cables provided to the components by referring to the cable tags at either end of the cable. All cable lengths are 10-feet except for ac power cords. Refer to Figure FO -1 , the master control station wiring diagram and Figure FO -2 , the slave station wiring diagram.

2.2 --Continued

AC power to the receiver control is connected to an auxiliary ac power receptacle on the back of the power supply. This allows all power to the receiver control to be switched on or off by the power supply on/off control. All ac power cords are standard three-prong cords that connect to standard 115 volt, 60 Hz power receptacles.

If the vector display option is used, the X-,Y- and Z- axis connections are made to the X, Y and Z outputs (J5, J6 and J7 on the DF chassis assembly back panel.

If the spectrum display option is used, it is connected to the SDU output (J4) of the DF chassis assembly back panel.

If an external collection receiver is used, it is connected to the external receiver output (J3). When a collection receiver is not used (i.e., not connected to J3 or not powered, even if connected), a 50 ohm termination must be connected to J3 to maintain accuracy.

CHAPTER 3

3. OPERATING INSTRUCTIONS

3.1 Turn On And Initialization

A) MASTER CONTROL STATION

The DF system is powered on by the master station power supply ON/OFF switch and by the DF chassis assembly ON/OFF switch. The ON/OFF switch on the DF unit must be in the ON position, its normal setting as this switch is over-ridden by the DF chassis assembly ON/OFF switch.

The system powers on with the receiver control operative and with the DF chassis assembly DF mode toggle switch, the manual DF pushbutton and the preamp ON/OFF toggle switch operative.

Receiver control front panel controls are set as follows for normal operation:

Test Tone ON/OFF	OFF
Man Gain	As desired
AGC/MGC/LMGC	As desired (normally in AGC)
Receiver A/B	A position (UP)
Squelch	As desired
SWP	Manual (down) (to change to sweep, follow procedure in receiver control manual)

3.1 --Continued

Receiver Mode Select	As desired
CW, AM, FM, USB, LSB	
RCVR monitor set in A position	

The DF chassis assembly front panel controls are set as follows:

DF Mode	As desired (manual (UP) position is normal setting)
Preamp ON/OFF	As desired (ON position is normal setting)
Receiver Audio Select	Local or remote (normally set on local)
Audio Output Level	Adjust to desired level

The DF unit powers on in the remote mode. Therefore, the keyboard is inoperative except for the specific command to put the unit in local mode. See Paragraph 3-2 for a discussion of this feature. The remote mode is the normal operating mode.

B) SLAVE STATION

The slave station is powered on by the DF chassis assembly ON/OFF switch. The ON/OFF switch on the DF unit must be in the ON position, its normal setting,as this switch is overridden by the DF chassis assembly ON/OFF switch.

The DF chassis assembly front panel controls are inoperative. The DF unit powers on in the remote mode. Therefore, the keyboard is inoperative except for the specific command to put the unit in local mode. See Paragraph 3-2b (1) below for a discussion of this feature.

3.2 Controls And Indicators

A) RECEIVER CONTROL UNIT

A summary of the controls and indicators for the receiver control are given in Table 3-1. The operation and maintenance manual for the receiver control should be consulted for a more detailed description.

B) DF CHASSIS ASSEMBLY

(1) Master Station Operation Controls and Indicators for the DF chassis assembly consist of controls and indicators located on the front panel and an additional set of controls and indicators found on the DF (plug-in) unit.

At the master station the DF chassis assembly operates in conjunction with the receiver control unit or it may operate alone. Operating alone, the DF unit chassis assembly performs the receiver control function. Used in conjunction with the receiver control, the DF (plug-in) unit must operate in the remote mode. This is the normal power-on self-initialization setting. Operating in conjunction with the receiver control, the DF chassis assembly front panel controls and indicators operate as summarized in Table 3-2.

To operate the DF chassis assembly alone, without the receiver control, the DF control indicator must be set to the LOCAL mode. This is accomplished by pressing SHIFT then 9 on the DF unit keyboard.

TABLE 3-1

RECEIVER CONTROL UNIT CONTROLS AND INDICATOR FUNCTIONS

Control or Indicator	Function
TEST TONE ON/OFF (toggle switch)	Activates receiver test tones for data link and receiver testing.
MAN GAIN (potentiometer)	Operates in conjunction with the AGC/MGC/LMGC switch. Fully cw allows maximum gain, fully ccw allows minimum gain for receiver.
AGC/MGC/LMGC (rotary switch)	Sets gain control function of the receiver.
AGC	In this position, receiver gain is controlled by AGC action.
MGC	In this position, receiver gain is controlled by MAN GAIN control setting.
LMGC	In this position, receiver gain is controlled by the MAN GAIN control and the AGC circuits.
RECEIVER A/B (toggle switch)	Selects A or B receiver.

TABLE 3-1 --Continued

Control or Indicator	Function
KEY/DSPL (indicator)	In the OFF position, indicates the receiver is tuned to the reading on the TUNING FREQUENCY (MHz) display. In the On position, displays the contents of the keyboard register.
TUNING FREQUENCY (MHz) (nixie indicators)	Displays tuning frequency or keyboard register (see above).
SQUELCH ON/OFF (toggle switch)	Controls squelch function of the receiver.
SWP DEVN (thumbwheel switches)	Used in conjunction with the SWP/MAN control to sweep a band of frequencies centered about the frequency set by the KEYBOARD TUNING switches. Sweeping is accomplished between 0.1 and 9.9 MHz. For example, setting the controls to 1.0 causes the receiver to sweep 1 MHz above and below the TUNING FREQUENCY (MHz) set by the keyboard.

TABLE 3-1 --Continued

Control or Indicator	Function
TUNE STEP (rotary switch)	Controls tuning steps in manual operation.
10 kHz	Permits 10 kHz tuning steps when rotating TUNING knob.
5 kHz	Permits 5 kHz tuning steps when rotating TUNING knob.
1 kHz	Permits 1 kHz tuning steps when rotating TUNING knob.
SWP RATE (potentiometer)	Used with the SWP DVN and SWP/MAN switches to determine sweep rate in conjunction with the TUNE STEP control. Maximum cw generates highest sweep frequency.
SWP/MAN (toggle switch)	Controls sweep tuning.
SWP	Automatic tuning over a band of frequencies centered about the setting of the TUNING FREQUENCY (MHz) switches. Amount of sweep determined by SWP DVN control, rate by SWP Rate control.

TABLE 3-1 --Continued

Control or Indicator	Function
MAN	Manual tuning by use of the KEYBOARD TUNING or TUNING control permitted.
SWP STOP (pushbutton)	Pressing this pushbutton enables STOP SWEEP operation. Pressing the pushbutton again initiates normal sweep operation.
SWP STOP (indicator)	Lit light on indicates receiver control is operating in the STOP SWEEP mode.
TUNING (knob)	Tunes receiver in steps selected by the TUNE STEP control.
ENTER (pushbutton)	Pressing this switch enters keyboard register data into the control panel tuning counter.
KEYBOARD TUNING (pushbuttons)	Sets up receiver tuning frequencies.
0-9	Enters frequency into keyboard register, in most significant to least significant digit order.
CL	Clears keyboard register.
KD	When pressed, displays frequency stored in keyboard register.

TABLE 3-1 --Continued

Control or Indicator	Function
MODE SELECT CW, AM, FM, VSB, LSB (dual control switch)*	Selects CW, AM, FM, USB or LSB mode of operation.
PHONES (jack)	Headset jack for monitoring receiver audio.
VOLUME (dual control)	Sets headset audio levels.
IF BW (kHz) (50, 30 or 8) (dual control rotary switch)*	Setting determines receiver bandwidth in kHz.
RCVR MONITOR	Local audio monitor control.
A	Data from RSF A is heard in headset plugged into PHONES jack.
BOTH	Selects audio for both RSF A and RSF B.
B	Data from RSF B is heard in headset plugged into PHONES jack.

TABLE 3-1 -- Continued

*These switches have two concentric controls. The black outside switch is for the receiver A, and the red inside switch is for the receiver B. The RECEIVER A/B switch selects which receiver data is transmitted over the data link. The RCU is cabled to transmit either receiver A or B data dependent on the setting of the A/B selection switch.

TABLE 3-2

DF CHASSIS ASSEMBLY FRONT PANEL CONTROLS AND INDICATORS

Control or Indicator	Function
Power ON/OFF (circuit breaker)	Applies power to the chassis.
Power (indicators)	In the ON position, indicates power applied to the unit.
DF Mode Manual/Continuous Mode* (toggle switch)	Selects the manual DF mode or the continuous DF mode. When in manual, the manual DF key is activated.
Manual DF* (key)	Activates a single DF measurement.
Preamp ON/OFF* (toggle switch)	In the On position, activates a preamplifier in the DF control indicator to preamplify the DF RF signal. In the OFF position, the preamplifier is bypassed.
Audio Select Control	Selects the audio to the DF chassis audio phone jack and the receiver control audio phone jack. Also selects the local audio and up to four remotely generated audio signals.
Volume	Adjusts audio volume at the DF chassis phone jack.

*These controls are activated only when a receiver control unit is connected to the DF chassis.

3.2 -- Continued

In the LOCAL mode, the DF chassis assembly front panel DF mode select switch, the manual DF key and the preamp ON/OFF switch are inoperative. These functions are available on the DF unit front panel.

Controls and indicators on the DF unit, as they operate in the local mode, are summarized in Table 3-3.

C) RADIO SET

The radio sets used for data link at the master and remote stations are set at the same frequency. The data link frequency must be a least 10 MHz removed from DF operating frequencies. The master station radio set, when cabled to the multiplexer, will automatically go to transmit when its power switch is set to either low or high mode.

The radio set at the remote station is set for receive when cabled to the demultiplexer. Its volume control must be adjusted to near maximum level. If the demultiplexer frame fault or parity fault indicator lights are lit, increase the volume control setting until they go off.

3.3 BITE Test

The DFS-7D unit has a built-in test equipment (BITE) capability.

The BITE test verifies the proper operation of the receiver, DF control indicator, antenna signal cable and DF antenna array.

3.3 -- Continued

To perform a BITE test, the DF antenna must be erected and the signal cable connected to the DF chassis assembly rear panel. No other equipment is needed. The BITE test mode is activated by putting the DF unit in the LOCAL mode. This is accomplished by pressing SHIFT, then 9, on the DFS-7D keyboard and then pressing SHIFT and 6. This initiates the BITE test. The BITE test terminates with the unit in continuous DF mode. The unit has passed the test if the BEARING display indicates 128 ± 4 and the KEYBOARD display indicates 128 ± 4. Any other indication on the displays (such as a number preceeded by the letter E) points to a malfunction in either the DF set, the receiver, the DF antenna or the antenna signal cable. Any test malfunction causing an error code to appear on the keyboard display (such as a number preceeded by the letter E), also causes the BITE test to prematurely terminate. To continue the test, push shift then 6 as often as necessary until the DF continuous mode indicator is lit. This indicates that all BITE tests have been performed.

To release the DFS-7D from the BITE test mode, press SHIFT, then 6, on the keyboard. This also releases the DF continuous mode. To return the unit to remote mode, press SHIFT, then 9.

TABLE 3-3

DIRECTION FINDING UNIT REMOTE MODE CONTROLS AND INDICATORS (DFS-7D)

Control or Indicator	Function
Power ON/OFF (toggle switch)	Applies power to the DF control indicator. The switch is normally left in on the ON position when the unit is plugged into the DF chassis (the DF chassis assembly power ON/OFF switch overrides this ON/OFF switch).
Freq/Time/BW (indicator)	Displays the receiver tuned frequency only.
Bearing (indicator)	Displays the direction finding bearing angle. An FFFF display indicates no signal present when a DF measurement is attempted.
Keyboard (indicator)	Not used.
I Offset (indicator)	Lit light on indicates that the displayed bearing has an internal offset added to the actual measured direction finding angle.
E Offset (indicator)	Lit light on indicates that the displayed bearing has an external offset added to the actual measured direction finding angle.

TABLE 3-3 --Continued

Control or Indicator	Function
1, 2 or 3 QUAL (indicator)	Lit light on indicates the quality of a measured bearing: 1) indicates good 2) indicates fair 3) indicates poor
Remote (indicator)	Lit light on indicates the unit is in the remote mode.
SHIFT and 9 (keys)	The only keys activated when the unit is in the remote mode. Pressing SHIFT, then 9, transferrs the unit to the local mode. (See Paragraph 3.3 for a description of this mode.)

C) MASTER STATION POWER SUPPLY, PP-5273 /MRD-502

Controls and indicators on the power supply are summarized in Table 3-4.

TABLE 3-4

POWER SUPPLY CONTROLS AND INDICATORS

Control or Indicator	Function
Power ON/OFF	Applies power to the unit. If tripped because of temporary overload, can be reset by turning OFF then ON again.
Power (indicator)	When ON, indicates power applied to unit.
+5 Volt (indicator)	When ON, indicates +5 Volt power supply is on.
+15 Volt (indicator)	When ON, indicates +15 Volt power supply is on.
-15 Volt (indicator)	When ON, indicates -15 Volt power supply is on.
+180 Volt (indicator)	When ON, indicates +180 Volt power supply is on.

CHAPTER 4

4. ALIGNMENT

4.1 Vector Display Alignment

The vector display is aligned while the test pattern is displayed. The test pattern appears when the direction finding unit is turned on or when [SHIFT] + [DF] is pushed on the direction finding unit's front panel.

NOTE

These controls are only activated when the unit is in the local mode.

The test pattern is turned off by pushing [SHIFT] + [DF]. The alignment consists of adjusting the X, Y and Z controls on the display device (for example an oscilloscope) until the test pattern is as shown in Figure 4-1. The X adjustment corresponds to the external horizontal sweep; the Y adjustment corresponds to the vertical gain and the Z adjustment corresponds to the internal input (if used). If Z axis (intensity) is not used, then adjust for a cross of equal length arms.

4.2 Spectrum Display Alignment

The DF receiver's IF signal can be viewed by a spectrum analyzer by connecting the front panel located SPECTRUM DISPLAY output to the spectrum analyzer input.

For tuned frequencies between 20 MHz and 59.999 MHz the IF frequency is 10.7 MHz. For tuned frequencies between 60 MHz and 150 MHz the IF frequency is 30.0 MHz.

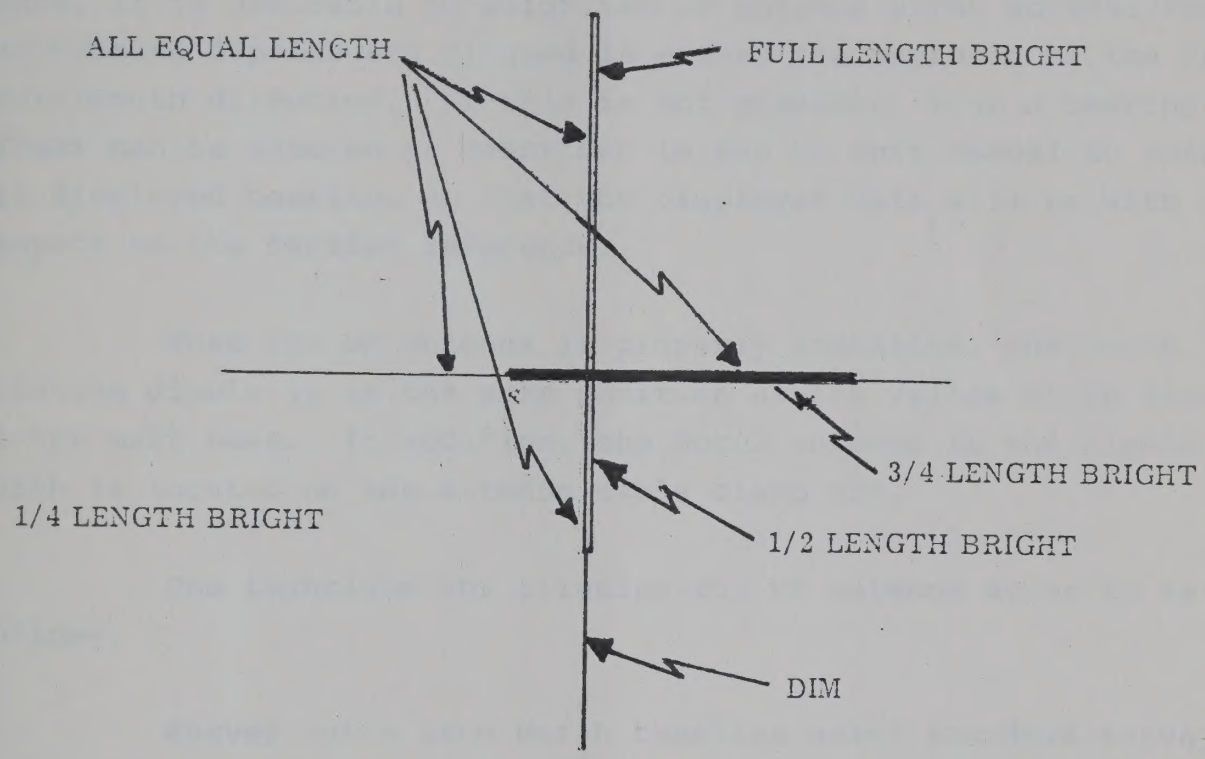
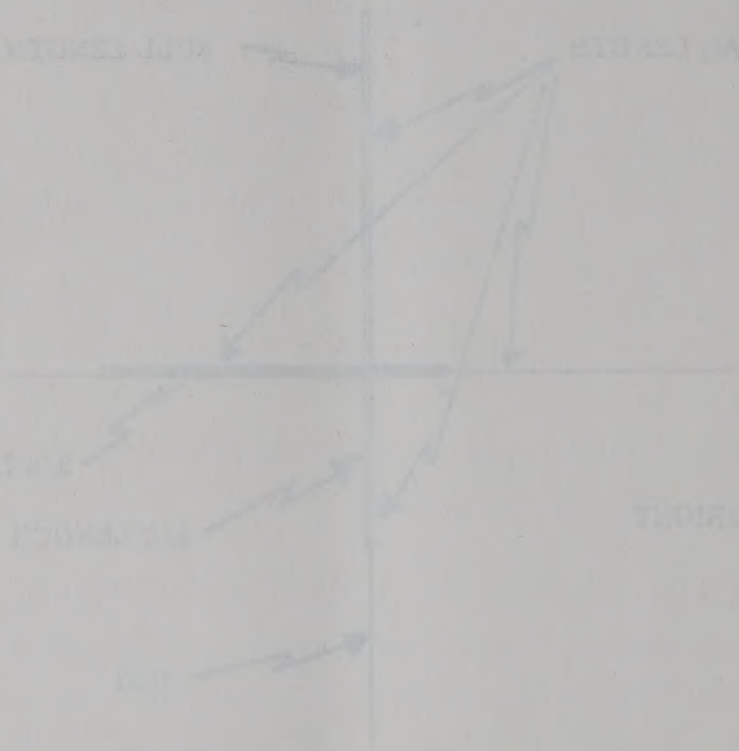


Figure 4-1. X-Y Test Pattern.



4.3 DF Antenna Alignment

All displayed bearings are with respect to the North/South baseline and are referenced to the North antenna dipole. Hence, it is desirable to align the DF antenna array so that the North/South dipoles are aligned in either the magnetic or the true North/South direction. If this is not possible, then a bearing OFFSET can be entered as described in the DF unit manual to correct all displayed bearings so that the displayed data will be with respect to the desired reference.

When the DF antenna is properly installed, the north pointing dipole is in the same position as the yellow strip located at the mast base. In addition, the North antenna is the dipole which is located on the antenna cable clamp arm.

One technique for aligning the DF antenna array is as follows:

Survey out a true North baseline using standard surveying techniques and mark with two stakes approximately 10-feet apart and approximately 50-feet from the DF antenna array mast location. Sight along a line parallel to the North/South stakes at the North/South DF antenna dipoles with the north dipole in the north direction. Rotate the array until the far dipole disappears behind the front located dipole while sighting along a line parallel to the North/South stakes. This will align the DF antenna array to within 0.25 degrees of the surveyed North/South baselines.

4.4 Demultiplexer Boards A1 and A2 Alignment

With a demultiplexer installed in a working system, certain adjustments can be made on circuit cards A1 and A2. These adjustments have been made previously at the factory with a multiplexer set for maximum output drive capability (see Paragraph 5.2), and driving a demultiplexer directly. Readjustment is not necessary unless the system is altered in a way that requires recalibration. (For example, a severe change in serial data signal strength coming from the multiplexer would require recalibration of A1, a less severe signal strength change would require no recalibration. See Paragraph 5.2.)

4.4.1 Bit Sync Board A1 Adjustments

Refer to FO-12 in the demultiplexer manual. These adjustments supersede the procedure outlined in Step a, Page 5-11 of the demultiplexer manual.

a) Install the demultiplexer in a working system.

b) Set R2 for IV_{pp} at wiper (this assumes the input voltage to the unit is at least $1V_{pp}$ (see Paragraph 5.2).

c) Adjust R13 for the negative pulse at TP4 to have a width of 545 microseconds. The pulse period should be about 706 microseconds.

d) Observe a small variation in the pulse rep rate when C28 is varied.

4.4.2 Demodulator Board A2 Adjustments

Refer to FO-3 in the demultiplexer manual. These adjustments supersede the procedure outlined in Step b Page 5-11 of the demultiplexer manual.

a) Install the demultiplexer in a working system.

b) Set a threshold of +3V and -3V respectively at J7 and J8 by adjusting potentiometers R35 and R34.

c) Place the oscilloscope vertical input on J6 and program into the demux a random series of 0's and 1's in the data stream (see Table C-2 of RCU manual).

d) Trigger the oscilloscope so that a stationary eye pattern is observed.

e) Using the balance pot, R32, adjust the monitored wave form for approximate semitry about 0 VDC.

f) Set the gain pot, R16, so that the eye pattern is $12V_{pp}$.

g) Set the timing pot R1, so that the peak overshoot is approximately correct, as shown in the eye pattern, Figure 4.1 (in this system manual).

h) Iterate on Steps e), f), and g) as necessary to achieve the eye pattern shown in Figure 4.2.

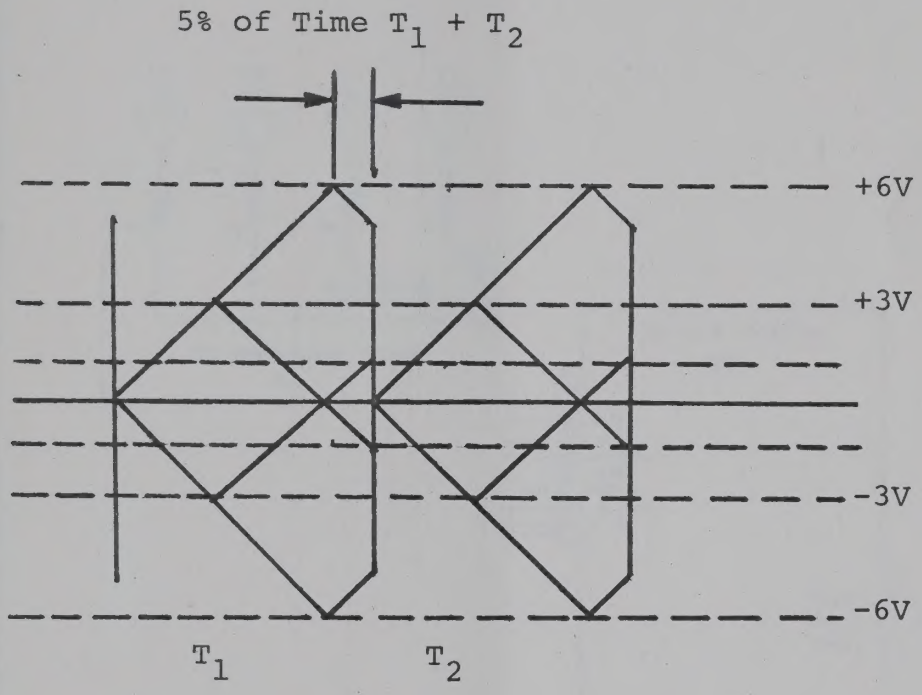
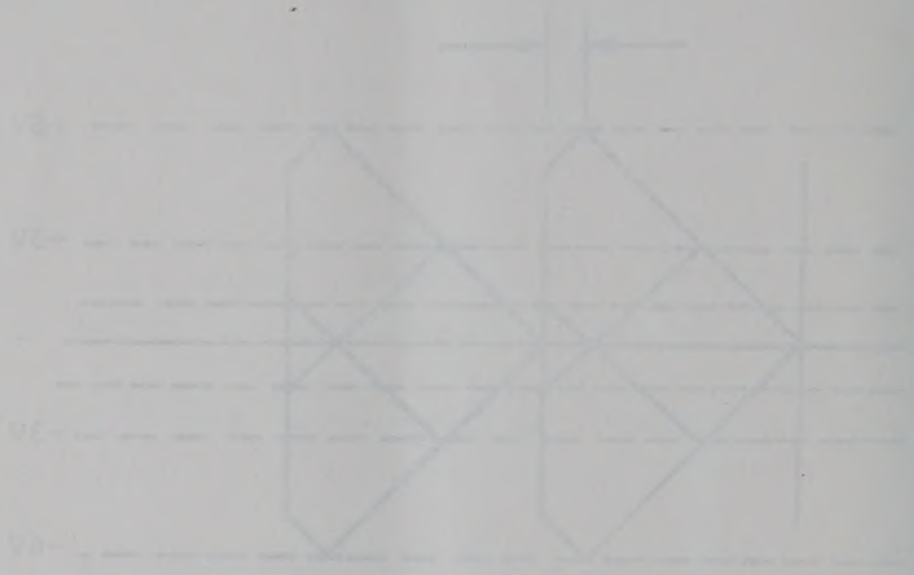
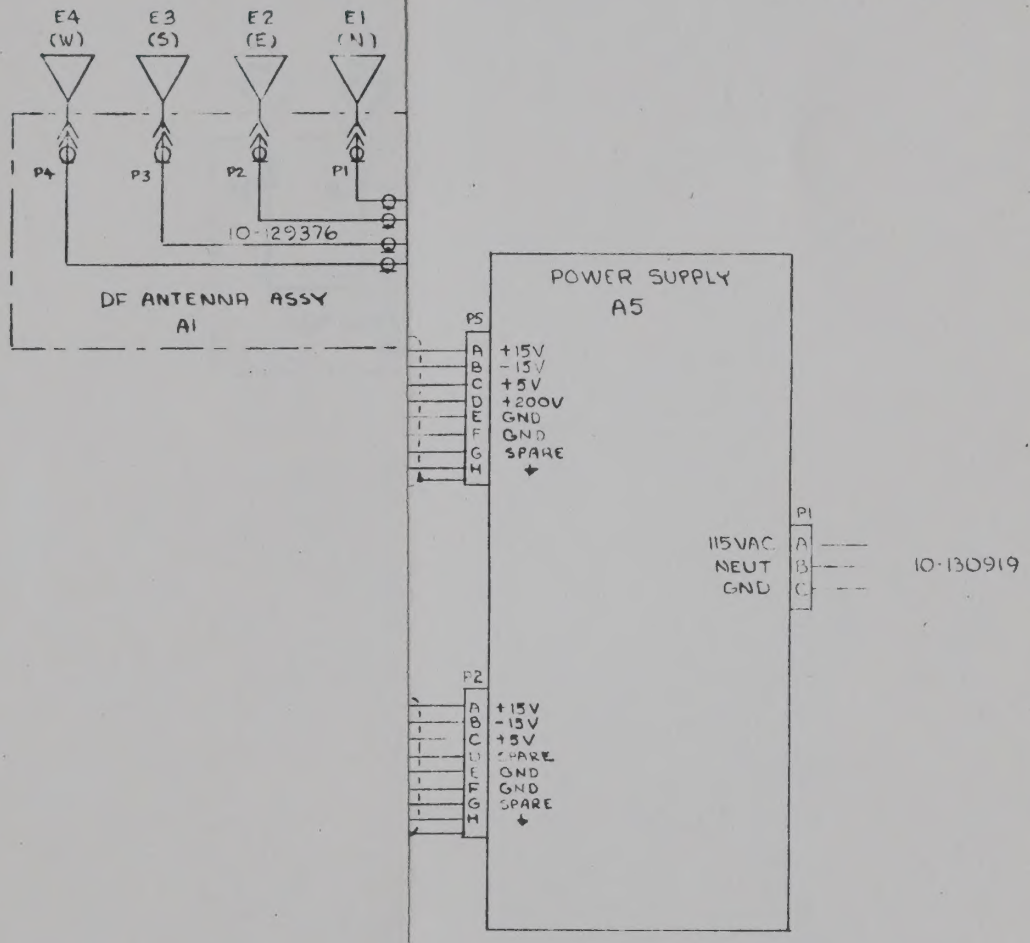


Figure 4-2. Eye Pattern for Test Point J6 of Demultiplexer Circuit Card A2.



REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	INITIAL RELEASE	8-7	

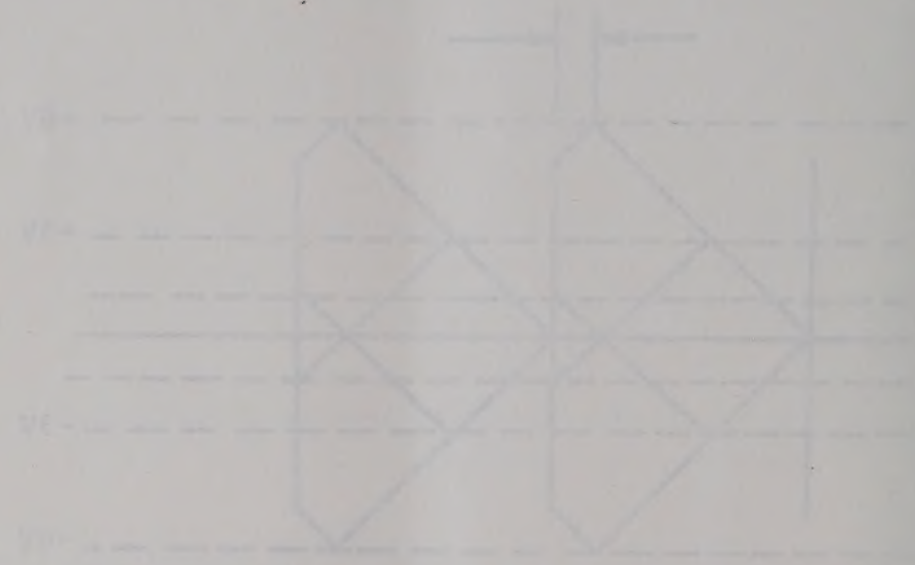


FO-1

QTY PER ASSY	PART NO. OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	NOTES	ITEM NO

PARTS LIST

DRAWN: R.L. STROOPE 8 76	ESL	INC · 495 JAVA DR. SUNNYVALE, CAL · 94086	
CHECKED:	MASTER STATION WIRING DIAGRAM (TIMBERWOLF)		
APPROVAL: 7/1177			
APPROVAL:	SIZE D	CODE IDENT 28815	DWG NO. 50-128138
APPROVAL:	SCALE	CONTRACT NO.	SHEET 1 OF 1



REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	INITIAL RELEASE	8-7	

DIRECTION FINDING SYSTEM DFS-7D-AM
A2

E4 (W) E3 (S) E2 (E) E1 (N)

P4 P3 P2 P1

J1 P1

10-129376

RG142

10-129377

P2

DF ANTENNA ASSY
A1

10-130919

P1 A B C — 115 VAC NEUT GND

P3
COL. RCVR OUT
P4 PAN DISP OUT
P5 X OUT
P6 Y OUT
P7 Z OUT
P8 SEL AUDIO OUT
P9 RMT AUDIO 1 IN
P10 2 IN
P11 3 IN
P12 4 IN

P16 +15V −15V +5V SPARE GND GND

P13 — 10-130916 — P1

A	SERIAL DATA
B	RTN
C	CLOCK IN
D	RTN
E	READ
F	RTN
H	CLOCK TO RCVR
G	RTN
J	RESYNC
K	RTN
L	INV. CLOCK OUT
M	RTN
N	READ OUT
P	RTN
R	+5VDC
S	+5VDC CON
T	LOAD PULSE TO RCVR
U	RTN
V	RCVR A/B LOGIC

P14 — 10-130909 — P2

A	AUDIO IN
B	RTN
C	SPARE BIT 1
D	46
E	50
F	SPECIAL OUT
G	SPARE
H	GND BUSS
J	SPARE BIT 2
K	
L	
M	
N	
P	
R	

RECIVER CONTROL
C603
A3

P10 A B C — 115 VAC NEUT GND — 10-130919

P3 — 10-130908 — P5

A	+15V
B	−15V
C	+5V
D	+200V
E	GND
F	GND
G	SPARE
H	

POWER SUPPLY
A5

P1 A B C — 115VAC NEUT GND — 10-130919

P15 — 10-130907 — P8

A	DATA PNL 1
B	RTN
C	CLOCK 1
D	RTN
E	READ 1
F	RTN
G	RESYNC 1
H	RTN
J	
K	

P16 A B C D E F G H

MULTIPLEXER
M701
A4

+15V	
−15V	
+5V	
GND	
GND	

P1 — 10-130908 — P2

A	+15V
B	−15V
C	+5V
D	SPARE
E	GND
F	GND
G	SPARE
H	

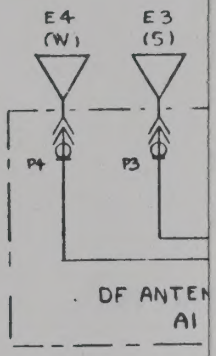
P3 — 10-130918 — RG223 — TO VRC-46 REXMIT -D- SHIELD -A- -C-

A	CMD DATA
B	RTN
C	
D	
E	
F	

FO-1

| | | | |

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	INITIAL RELEASE	8-76	KLS



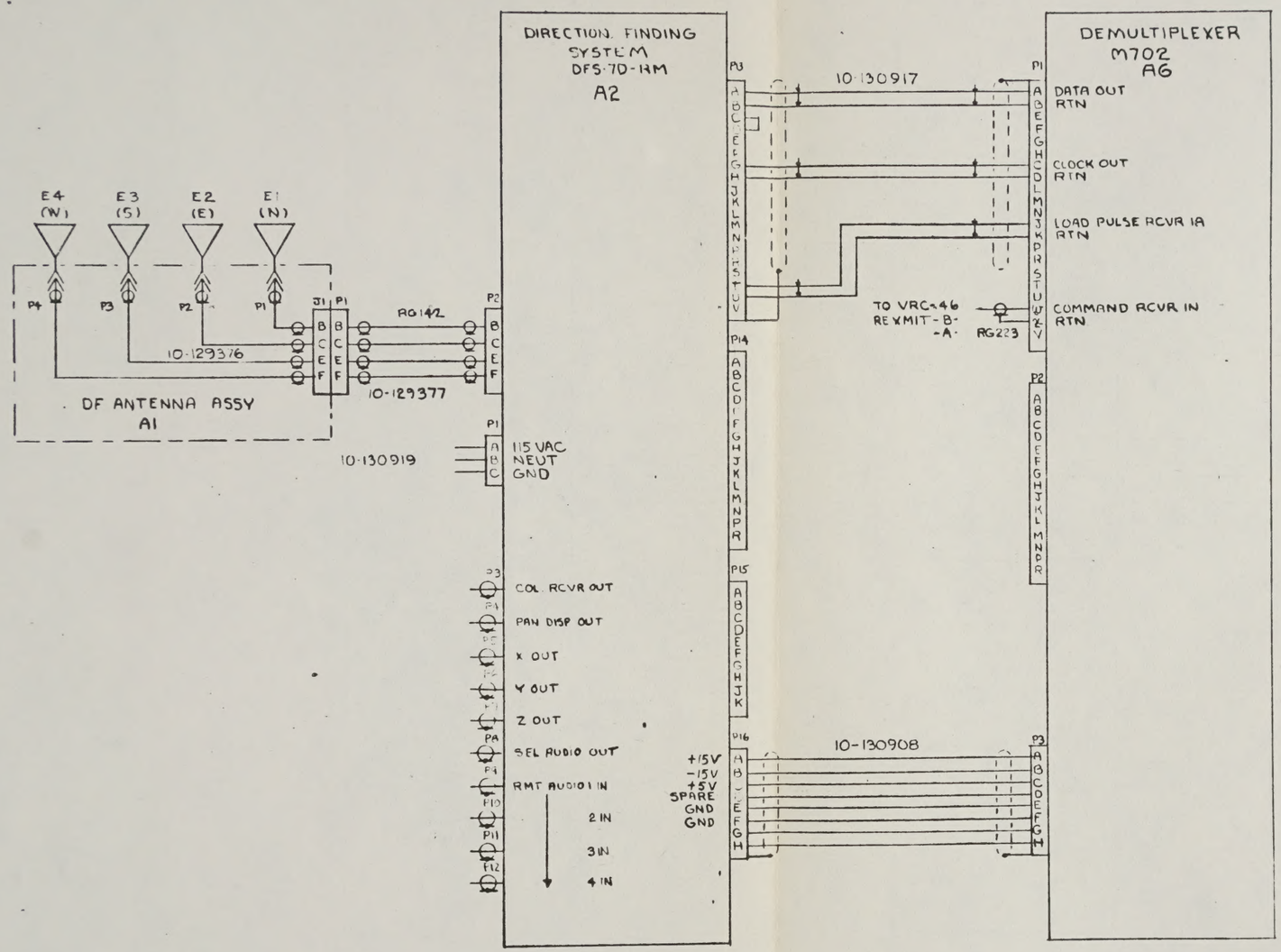
FO-2

CODE IDENT	PART NO. OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	NOTES	ITEM NO

PARTS LIST

DRAWN: R L STROOPE 8-76	ESL INC · 495 JAVA DR. SUNNYVALE, CAL · 94086		
CHECKED:	REMOTE STATION WIRING DIAGRAM (TIMBERWOLF)		
APPROVAL: 7/1/77			
APPROVAL:	SIZE D	CODE IDENT 28815	DWG NO. 50-131179
APPROVAL:	SCALE	CONTRACT NO.	SHEET 1 OF 1

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	INITIAL RELEASE	8-76	KLS



FO-2

CODE IDENT	PART NO. OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	NOTES	ITEM NO

QTY PER DASH NO — PARTS LIST

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON:
FRACTIONS ± | TWO PLACE DECIMALS ±
ANGLES ± | THREE PLACE DECIMALS ±
REMOVE ALL BURRS AND SHARP EDGES. DIMENSIONS AND TOLERANCES SHALL BE HELD AFTER PLATING. MACHINE SURFACES TO BE √ RMS.
MATERIAL

DRAWN: R L STROOPE 8-76 — DATE
CHECKED:
APPROVAL: 7/1/77
APPROVAL:
APPROVAL:

E S L INC · 495 JAVA DR. SUNNYVALE, CAL · 94086

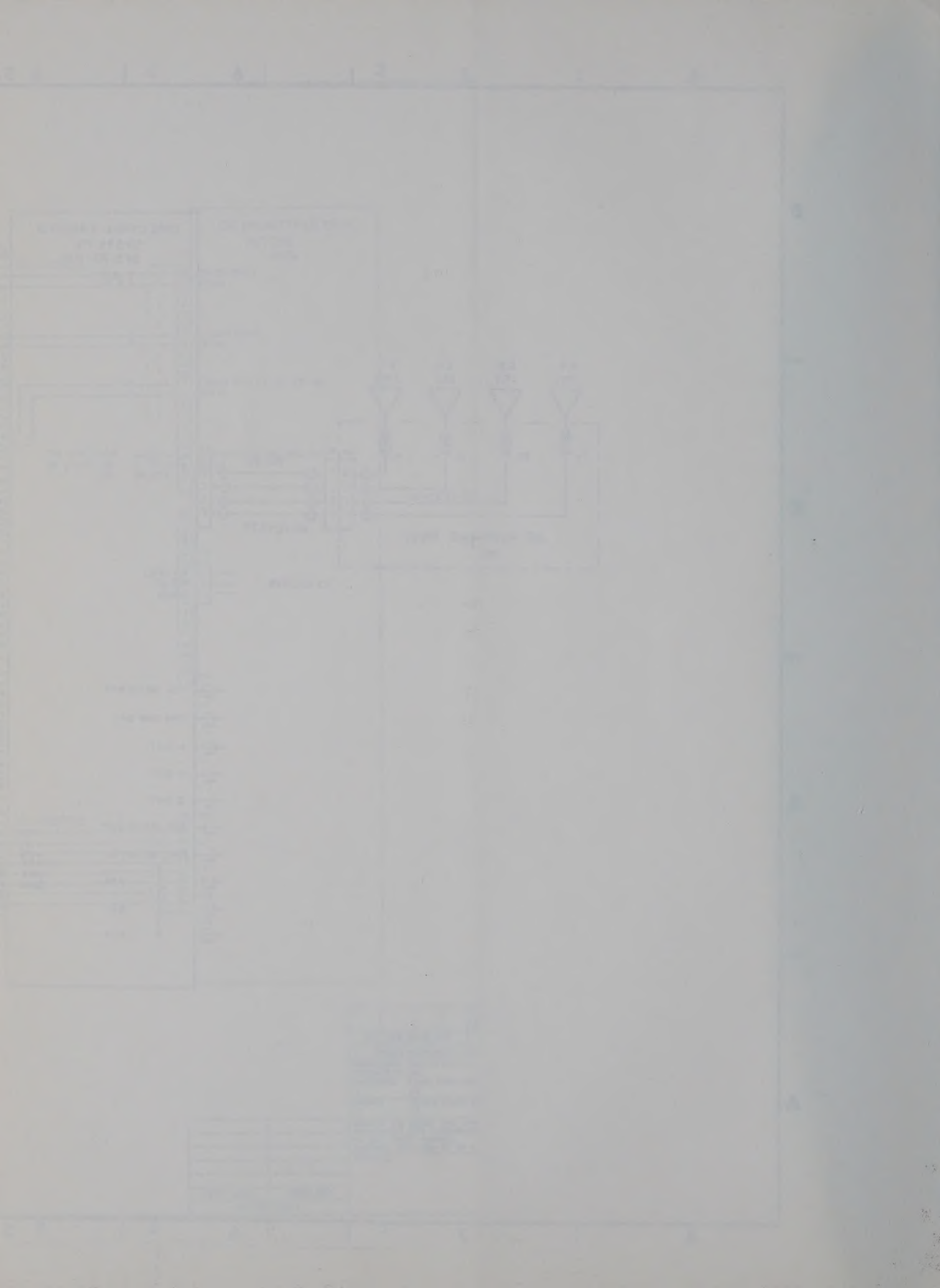
REMOTE STATION WIRING DIAGRAM (TIMBERWOLF)

SIZE	CODE IDENT	DWG NO.
D	28815	50-131179

SCALE	CONTRACT NO.	SHEET
		1 OF 1

NEXT ASSY	USED ON
	1925

APPLICATION



APPENDIX A

Antenna Assembly
Parts List and Schematic

10-128026
50-128028
10-129376

ESL INCORPORATED · 495 JAVA DRIVE · SUNNYVALE, CALIF.	CODE IDENT 28815	PL 10-128026	REV

CONTRACT NO.		NOMENCLATURE	SHEET 1 of 4
PREP V. GEILE	DATE 9-30-76	APPD	DATE
CHECK		APPD V. M. Geile	10/11/76
ENGR		APPD	

ANTENNA

DASH NO.	APPLICATION		REVISIONS			
	NEXT ASSY	USED ON	LTR	DESCRIPTION	CHK / APPD	DATE
			A	INITAL RELEASE	V. M. G.	10/11/76

NOTES :

SHEET	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
REVISION																																					

ESL INCORPORATED · 495 JAVA DRIVE · SUNNYVALE, CALIF.

CODE IDENT 28815

PL 10-128026

REV

KEY: * VENDOR ITEM · SEE SPECIFICATION CONTROL (OR SOURCE CONTROL) DWG.

CONTRACT NO.

SHEET 2

ITEM NO.	QTY / DASH NO. -1	CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	SPEC / MATERIAL OR REFERENCE DESIGNATION	KEY
1	REF		50-128028	WIRING DIAGRAM		
2	1		10-129087-1	CHASSIS, ELEC EQPT		
3	1		12-129088-1	COVER, ACCESS		
4	1		10-136665-1	HUB ASSY, ANTENNA		
5	4		10-128027-1	BOOM, ANTENNA		
6	4		10-127395-1	ELEC COMPONENTS ASSY		
7	4		10-128036-1	COUPLER, INSULATOR		
8	8		12-128046-1	STUD, ANTENNA ELEMENT		
9	8		12-128040-1	CLAMP, ANTENNA STUD		
10	8		10-128039-1	ELEMENT, ANTENNA		
11	4		10-128029-1	CLAMP, ANTENNA BOOM		
12	1		12-128047-1	BRACKET, CABLE		
13	1		12-128048-1	CLAMP, CABLE		
14	4		10-133176-1	SPACER, ANTENNA BOOM CLAMP		
15	2		12-	SPACER, CABLE BRACKET		
16	1		L22TF9654N1	CONNECTOR, RF		
17						
18	1		12-137061-3	NAME PLATE		

ESL INCORPORATED · 495 JAVA DRIVE · SUNNYVALE, CALIF.

CODE IDENT 28815

PL 10-128026

REV

KEY: * VENDOR ITEM · SEE SPECIFICATION CONTROL (OR SOURCE CONTROL) DWG.

CONTRACT NO.

SHEET 4

ITEM NO.	QTY / DASH NO. -1	CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	SPEC / MATERIAL OR REFERENCE DESIGNATION	KEY
37	14	96906	MS15795-808	WASHER, FLAT (NO. 10)		
38						
39	8	96906	MS35338-135	WASHER, LOCK (NO. 4)		
40	2	96906	MS35338-138	WASHER, LOCK (NO. 10)		
41	8	80205	NAS620-4	WASHER, FLAT (NO. 4)		
42	16	80205	NAS620-8	WASHER, FLAT (NO. 8)		
43						
44	2	80205	NAS671-10	NUT, PLAIN (NO. 10)		
45						
46						
47						
48						
49						
50						
51						
52						
53						
54						

INCORPORATED • 495 JAVA DRIVE • SUNNYVALE, CALIF.

PL 10-129376		A
CODE IDENT 28815	SHEET 1 OF 2	REV

CONTR NO	PREP R. Strong DATE 11/15/76
PROJECT NUMBER	CHK
	APPD R Strong 11/15/76
	APPD R McEuen 7/11/77

CABLE ASSY, ANTENNA

SYM	REVISION DESCRIPTION	DATE	APPROVED	SYM	REVISION DESCRIPTION	DATE	APPROVED

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42

RECORD OF REVISION STATUS OF EACH SHEET

	MODEL	PL 10-129376

ESL INCORPORATED · 495 JAVA DRIVE · SUNNYVALE, CALIF.

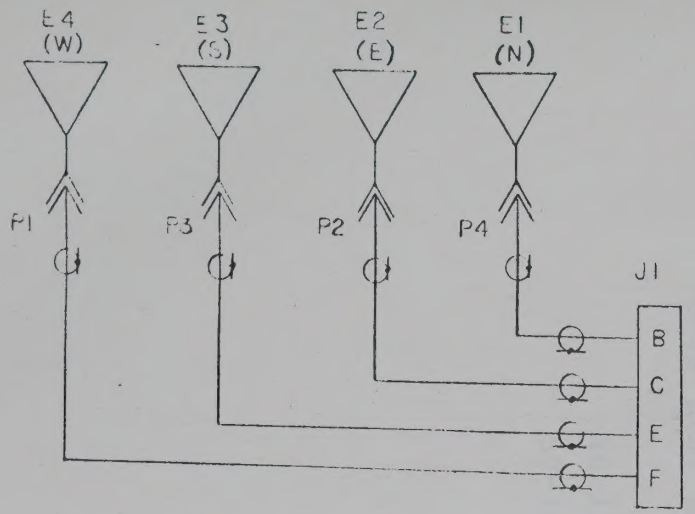
CODE IDENT	PL	REV
28815	10-129376	A

KEY: * VENDOR ITEM - SEE SPECIFICATION CONTROL (OR SOURCE CONTROL) DWG. | CONTRACT NO. | SHEET

ITEM NO.	QTY / DASH NO.			CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	SPEC / MATERIAL OR REFERENCE DESIGNATION	KEY
	REF			28815	50-128138	WIRING DIAGRAM		
1	1			09922	L22TF96S4N1	CONNECTOR	J1	
2	4			09922	LRCXSK-1	CONTACT		
3	4			96918	KA59-191	CONNECTOR (TNC)	P1, P2, P3, P4	
4	A/R			81349	RG142B/U	CABLE, RF		
5	A/R			06090	PVC ½	HEAT SHRINK TUBING		
6	A/R			59730	WTW-1334	CABLE MARKER		

INCORPORATED · APS JAVA CSI-S · SUNNYVALE CALIF.	CODE IDENT 28815	PL 10-128026	REV
KEY: * VENDOR ITEM - SEE SPECIFICATION CONTROL (OR SOURCE CONTROL) DWG.		CONTRACT NO.	SHEET 3

ITEM NO.	QTY / DASH NO.			CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	SPEC / MATERIAL OR REFERENCE DESIGNATION	KEY
			-1					
19								
20								
21								
22								
23								
24			8	96906	MS24693-C50	SCREW, MACHINE (8-32×.50L)		
25								
26								
27			8	96906	MS51957-20	SCREW, MACHINE (4-40×.88L)		
28			32	96906	MS51957-46	SCREW, MACHINE (8-32×.62L)		
29								
30								
31								
32			4	96906	MS51958-65	SCREW, MACHINE (10-32×.75L)		
33			4	96906	MS51958-66	SCREW, MACHINE (10-32×.88L)		
34			8	96906	MS51958-67	SCREW, MACHINE (10-32×1.00L)		
35								
36			16.	96906	MS15795-807	WASHER, FLAT (NO. 8)		



DWG NO.	SH

REVISIONS				
REV	DESCRIPTION	CHKR	DATE	APPROVED

ITEM NO.	QTY / DASH NO.	CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	SPEC / MATL OR REF DES
PARTS LIST (OR LIST OF MATERIAL)					

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES
3 PLACE DECIMALS ±
2 PLACE DECIMALS ± ANGLES ± 1/2°
DRILL SIZE AND DRILLED HOLE TOLERANCES PER AND 10387
REMOVE ALL BURRS AND SHARP EDGES.
DIMENSIONS AND TOLERANCES SHALL BE HELD AFTER PLATING.

NEXT ASSY | USED ON

APPLICATION

CONTRACT NO.

DRAWN W McGuire DATE

CHECKED

ISSUED

APPROVAL J McLuvie

APPROVAL

APPROVAL

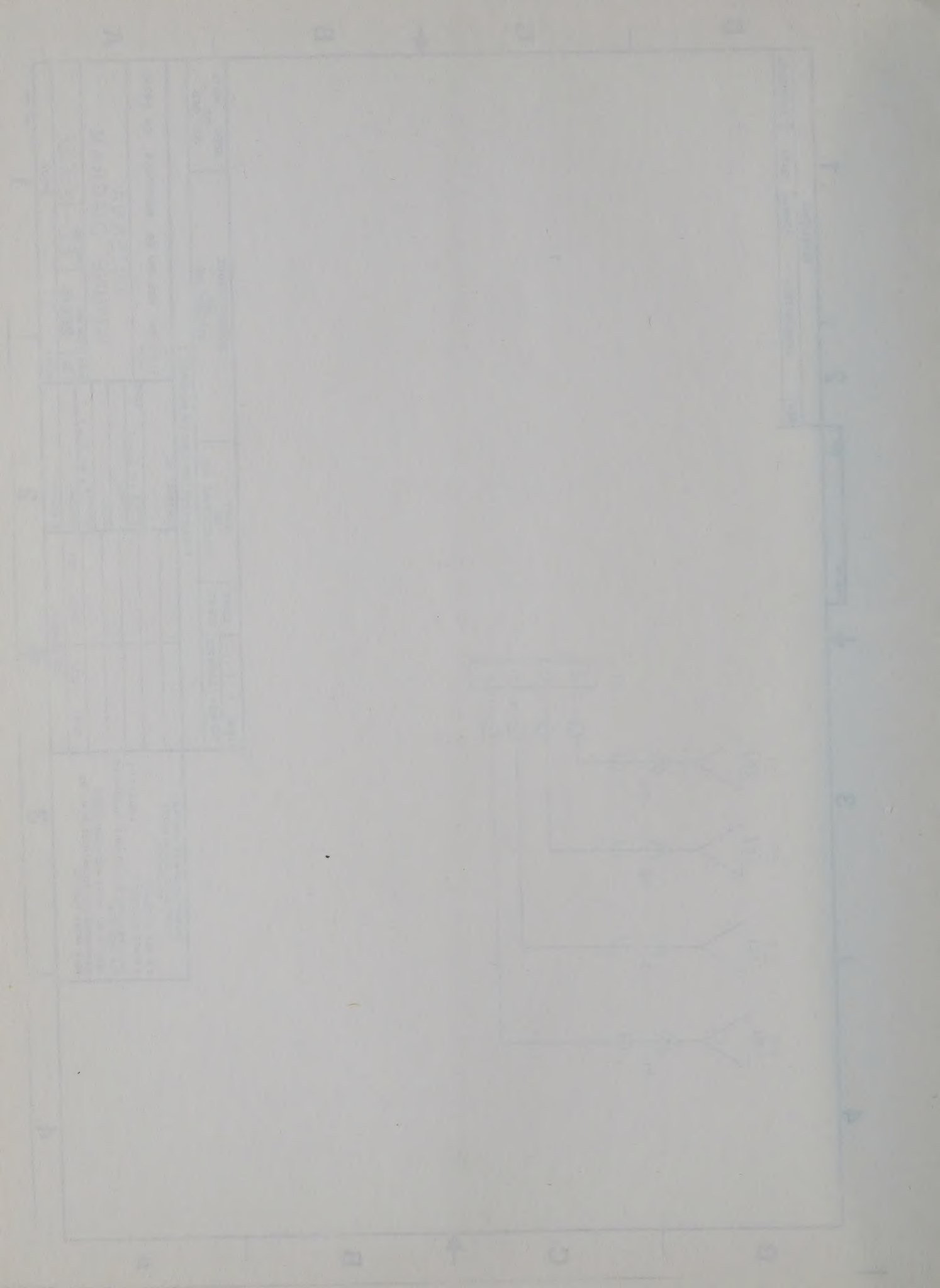
ESL INC 495 JAVA DR. SUNNYVALE, CA 94086

ANTENNA WIRING DIAGRAM

SIZE	FSCM NO.	DWG NO.
B	28815	5C-128028

SCALE | SHEET

ESL-400 1/77



APPENDIX B

Power Supply Assembly
Parts List and Schematic

10-129035
50-129770

ESL INCORPORATED • 495 JAVA DRIVE • SUNNYVALE, CALIF.

PL 10-129035 | A

CODE IDENT 28815 | SHEET 1 OF 3 | REV

CONTR NO	PREP R SATBOCH DATE 6-77
PROJECT NUMBER 1995	CHK
	APPD Wm Rudd 6-77
	APPD

POWER SUPPLY / MONITOR STATION

SYM	REVISION DESCRIPTION	DATE	APPROVED
A	INITIAL RELEASE	7/2/77	[illegible]

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42

RECORD OF REVISION STATUS OF EACH SHEET

MODEL

PL 10-129035

NOTES:

QTY/DASH NO.	KEY	CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	REFERENCE DESIGNATION	ITEM NO.
			50-129770	WIRING DIAGRAM		
1						
1		74193	JA1A2A5-2	CIRCUT BREAKER	CB1	
1		96906	MS25257-1	LAMP HOLDER		
2		08730	FCA-8	HANDLE		
1		96906	38TB10	TERMINAL BOAD	TB1	
1		80103	LRA-11	RACK ADAPTER		
1		80103	LM-0V3	OVER VOLTAGE PROTECTOR		
1		80103	LXS-EE5-0VR	POWER SUPPLY	PS1	
1		80103	LXD-C-152P	POWER SUPPLY	PS2	
1		ACOPIAN	U180Y20	POWER SUPPLY	PS3	
1			8500P	FAN		
1			MS3122E 12-3P	CONNECTOR	J1	
5			MS3122E 16-8S	CONNECTOR	J2 - J6	
1		28815	12-122647-1	BACK PANEL		
1		28815	12-122800-1	TOP PANEL		
1		28815	12-126648-1	FRONT PANEL		
1		28815	12-131066	FAN MNTG BRACKET		
1		28815	12-131067	PWR SUPPLY MNTG PLATE		
1		28815	12-130899	BRACKET, RESISTOR MNTG		

ESL INCORPORATED

KEY: * - VENDOR ITEM - SEE SPECIFICATION CONTROL OR SOURCE CONTROL DRAWING
F - FEET I - INCHES B - BULK
AR - AS REQUIRED N - SEE NOTES

PL 10-129035 A

CODE IDENT 28815 SHEET 2 REV

NOTES:

QTY/DASH NO.			KEY	CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	REFERENCE DESIGNATION	ITEM NO.
A/R				28815	58-119843-10	16 AWG WIRE		
2					680 Ω	1/4 W RESISTOR	R1, R2	
1					270 Ω	1/4 W RESISTOR	R3	
1				OHMITE	RH5	7.4 Ω 5W 1% RESISTOR	R4	
				96906	MS30924-10-1	TIP, JACK		
1					5261	RECEPTACLE	J7	

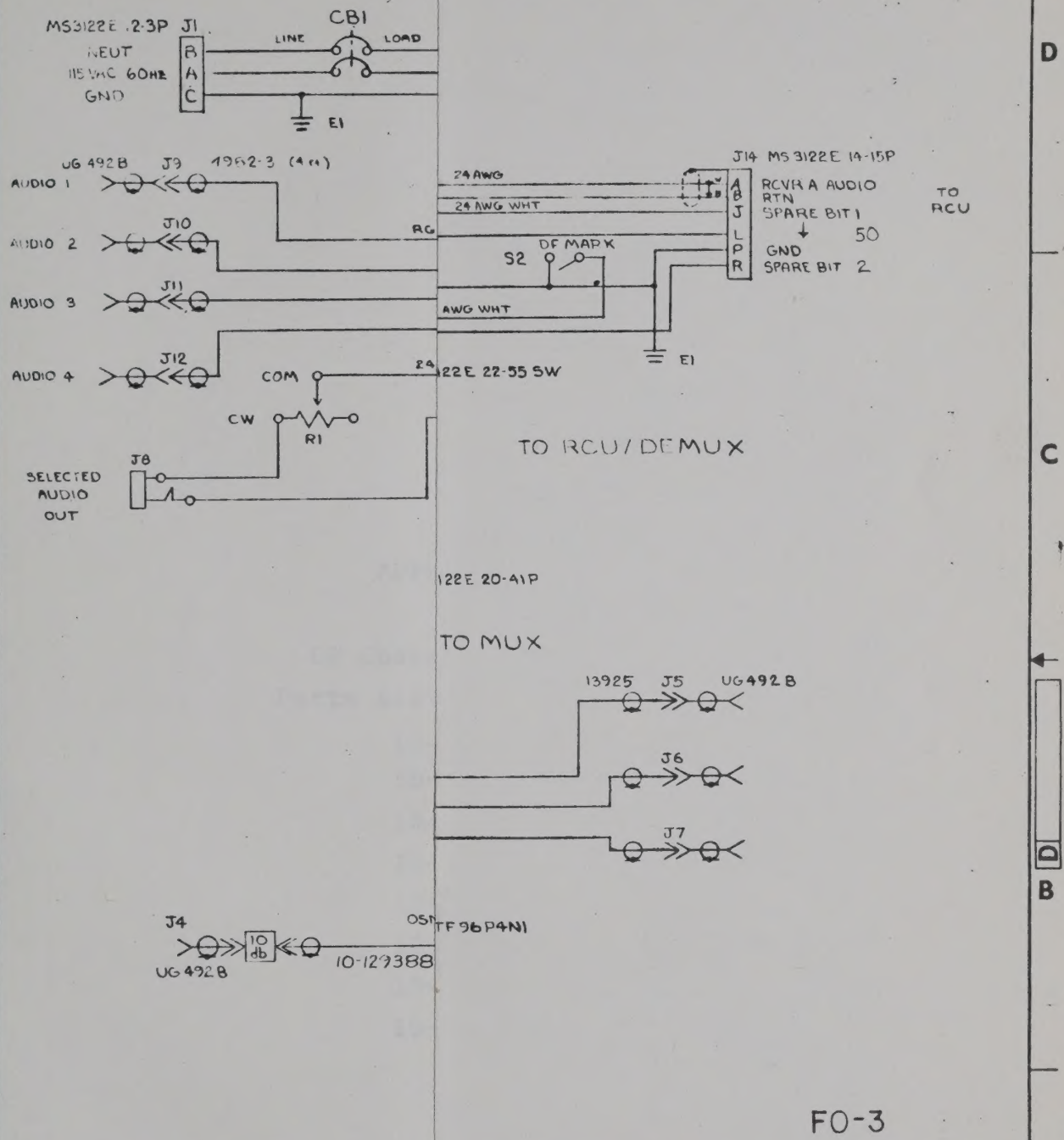
ESL INCORPORATED

KEY: * - VENDOR ITEM - SEE SPECIFICATION CONTROL OR SOURCE CONTROL DRAWING
F - FEET I - INCHES B - BULK
AR - AS REQUIRED N - SEE NOTES

PL 10-129035 A

CODE IDENT 28815 SHEET 3 REV

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	INITIAL RELEASE	6-77	RCS
	D	CORRECTED 6-28-77	6-28-77	



FO-3

NOTES:

1. THE DISCRIMINATOR
ARE STOWED FOR

ITEM NO	NOTES	NOMENCLATURE OR DESCRIPTION	PART NO. OR IDENTIFYING NO.

PARTS LIST

DRAWN: R.L. STROOPE DATE 7/1/77	ESL INC · 495 JAVA DR. SUNNYVALE, CAL · 94086
CHECKED:	DF PROCESSOR WIRING DIAGRAM DFS-7D-RM
APPROVAL: R. McLaurin 7/1/77	
APPROVAL:	SIZE D · CODE IDENT 28815 · DWG NO. 50-131180
APPROVAL:	SCALE · CONTRACT NO. · SHEET 1 OF 1

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	INITIAL RELEASE	6-77	RCS
	D	CORRECTED 6-28-77	6-28-77	[illegible]

MS3122E 12-3P J1
NEUT
115 VAC 60HZ
GND
LINE
LOAD
CB1
DS1
TB1
PS1 +5VDC +5V GND -5V
J16 MS3122E 16-8S
20 AWG RED
20 AWG BLK
20 AWG VIO
20 AWG RED
E1
UG 492 B J9 19K2-3 (4 ea)
AUDIO 1
AUDIO 2
AUDIO 3
AUDIO 4
J10
J11
J12
RG 178
COM
CW
R1
24 AWG WHT
S1
RMT AUDIO SEL. SW.
SELECTED AUDIO OUT
J8
A2A1 RECEIVER
P4 OSM501-1
ANT
P1 2DA31P
+15
-15
+5
+5
+5
+36
GND
SDU SW IN
CLK
RTN
SERIAL DATA
RTN
LOAD
RTN
P2 DEM9S
AUDIO NB
GND
DISC MON
AGC
DF AUDIO
20 AWG
PG 223
10-129389
OSM501-1 P2
ANT OUT
DBM 25P P5
24 AWG RED
24 AWG VIO
24 AWG BLU
24 AWG RED
24 AWG GRN
24 AWG
24 AWG TSP
24 AWG SCS
10-129386
A2A2 DF SET
AC IN
SERVO TEST
P4
SERIAL DATA RTN
CLK RTN
RESYNC RTN
LOAD RTN
DATA PNL1 RTN
CLK PNL 1 RTN
READ PNL 1 RTN
CLK
RTN
SERIAL DATA RTN
LOAD RTN
AUDIO RTN
AGC
DF SERVO
RCVR OUT
X OUT
Y OUT
Z OUT
ANT 1
ANT 2
ANT 3
ANT 4
PG
GND
24 AWG BLK
PREAMP S4
DF MODE S3
DF MARK S2
24 AWG WHT
J14 MS3122E 14-15P
RCVR A AUDIO RTN
SPARE BIT 1
50
GND
SPARE BIT 2
TO RCU
J13 MS3122E 22-55 SW
TO RCU/DFMUX
J15 MS3122E 20-41P
TO MUX
10-129380
20 AWG SCS
J6
J7
13925 J5 UG492B
P7 OSM501-1
P8
P9
P10
RG-142 B/U
J2 L22TF96P4N1
10-129378
J4
UG 492 B
10 dB
OSM501-1
10-129388-1
SDU
UG 492 B J3 UG88 E/U
OSM501-1 P3
10-129388-2
OSM501-1 P1
RG223
24 AWG SCS
1

NOTES:
1. THE DISCRIMINATOR MONITOR WIRES ARE STOWED FOR FUTURE USE.

FO-3

QTY PER DASH NO	CODE IDENT	PART NO. OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	NOTES	ITEM NO
PARTS LIST					

NEXT ASSY	1995
USED ON	
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON:
FRACTIONS ± | TWO PLACE DECIMALS ± | ANGLES ± | THREE PLACE DECIMALS ±
REMOVE ALL BURRS AND SHARP EDGES. DIMENSIONS AND TOLERANCES SHALL BE HELD AFTER PLATING. MACHINE SURFACES TO BE √ RMS.
MATERIAL

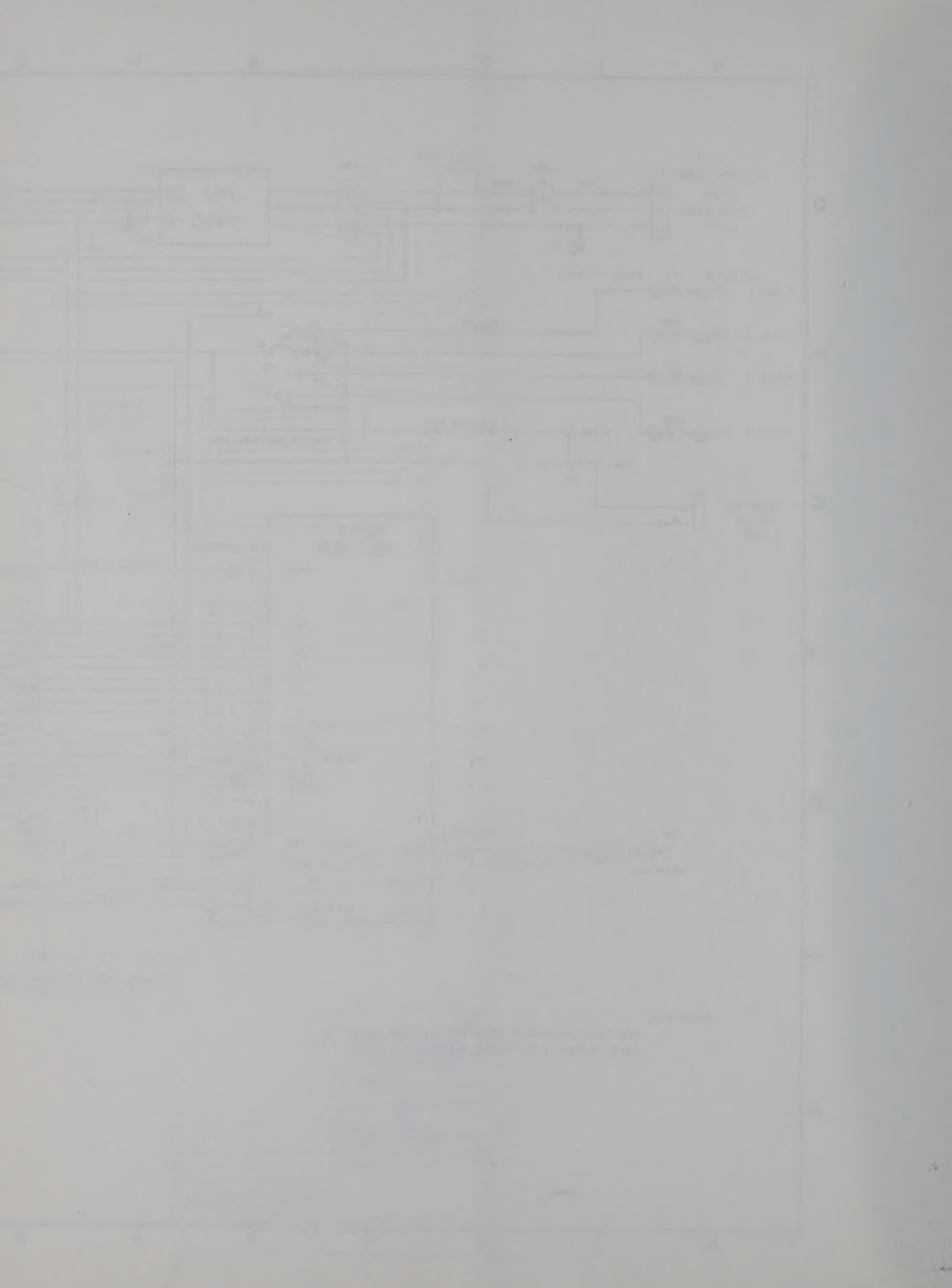
DRAWN: R.L. STROOPE 10/77 DATE
CHECKED:
APPROVAL: R. McEwen 7/1/77
APPROVAL:
APPROVAL:

E-Systems INC · 495 JAVA DR. SUNNYVALE, CAL · 94086

DF PROCESSOR WIRING DIAGRAM
DFS-7D-RM

SIZE	CODE IDENT	DWG. NO.
D	28815	50-131180

SCALE	CONTRACT NO.	SHEET
		1 OF 1



APPENDIX C

DF Chassis Assembly
Parts List and Schematic

10-124465
50-131180 (see FO-3)
10-129389
10-129378
10-129388-1
10-129388-2
10-129386
10-129380

INCORPORATED · 495 JAVA DRIVE · SUNNYVALE, CALIF.	CODE IDENT 28815	PL 10-124465	REV

CONTRACT NO.		NOMENCLATURE	SHEET 1 of 3
PREP W. McGuire DATE 3/8/77	APPD DATE	DF CHASSIS ASSEMBLY	
CHECK	APPD W. McGuire 3/10/77		
ENGR	APPD		

DASH NO.	APPLICATION		REVISIONS			
	NEXT ASSY	USED ON	LTR	DESCRIPTION	CHK / APPD	DATE

NOTES :

SHEET	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
REVISION																																					

ESL INCORPORATED · 495 JAVA DRIVE · SUNNYVALE, CALIF.

CODE IDENT 28815

PL 10-124465

REV

KEY: * VENDOR ITEM · SEE SPECIFICATION CONTROL (OR SOURCE CONTROL) DWG.

CONTRACT NO.

SHEET 2

ITEM NO.	QTY / DASH NO.		-/	CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	SPEC / MATERIAL OR REFERENCE DESIGNATION	KEY
					50-131180	Schematic System Wiring Diagram		
			1	Rogan	RB67-1-DC-M	Knob, 1/8" Shaft	R1	
			1		RV6NAYSD103A	Resistor, Variable, 10KΩ, non-locking	R1	
			9		UG492D/U	Bulkhead Connector	J3,4,5,6,7,9,10,11,12	
			1	Smith	275	Phone Jack, 1/4"	J8	
			1	28815	12-129336	Plate Mfg.		
			1	28815	12-129337-1	Bracket, Retain		
			1	28815	12-129337-2	Bracket, Retain		
			1	28815	12-129339	Panel, Front		
			1	28815	12-129340	Panel, Rear		
			1	28815	12-129346	Tray		
			2	Vamline	SS-6	Handle		
			4	Vamline	SS-F	Ferrule		
			1	Berry Contls	3098-005-000	Rear Retainer		
			1	Texcan	FP-50	10 dB Pad (Pan Display Output)	J4	
			1	28815	10-129378	Cable Assembly, RF		
			1	28815	10-129379	Cable Assembly		
			1	28815	10-129386	Cable Assembly		

ESL INCORPORATED · 495 JAVA DRIVE · SUNNYVALE, CALIF.	CODE IDENT 28815	PL 10-124465	REV
KEY: * VENDOR ITEM - SEE SPECIFICATION CONTROL (OR SOURCE CONTROL) DWG.		CONTRACT NO.	SHEET 3

ITEM NO.	QTY / DASH NO.			CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	SPEC / MATERIAL OR REFERENCE DESIGNATION	KEY
			-/					
			1	28815	10-129387	Cable Assembly, IF		
			1	28815	10-129388	Cable Assembly, IF		
			1	28815	10-129389	Cable Assembly		
			1	28815	10-129390	Cable Assembly		
			1	Power Tech, Inc	3D5-3.0 XR Series	Power Supply	PS1	
			1		50-A60-01-01-06N	Switch	S1	
			1		MS3122E14-15P	Connector	J14	
			1		MS3122E22-55SW	Connector	J13	
			1		MS3122E20-41P	Connector	J15	
			1		MS3122E16-8S	Connector	J16	
			1		MS3122E12-3P	Connector	J1	
			2	Cutler Hammer	8868K7	Switch SPST, Toggle	S3, S4	
			1	Jay-EL	10648 EL-54	Switch, Push Button	S2	
			1	Henman	JA1-A2-A-3-2	Circuit Breaker	CB1	
			1	Kulka	3PTB-10	Terminal Board	TB1	
			1		137-8836-0933-552	Light	DS1	
			1		RB-67-1-DC-M	Knob, 1/8" Shaft	S1	

| | | |

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41

RECORD OF REVISION STATUS OF EACH SHEET

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES

DECIMALS	ANGLES
2 PLACE ±	±
3 PLACE ±	

CONTRACT NO.

PREP R. [illegible] DATE 7/76

CHK

APPD QA

APPD [illegible] 7-7-76

APPD

ESL INCORPORATED · 495 JAVA DRIVE · SUNNYVALE, CALIF.

TITLE

CABLE ASSY, RF

SIZE	CODE IDENT NO.	DWG NO.
	28815	10-129378

SCALE	REV	SHEET
		1 of 2

FORM 394

ESL INCORPORATED · 495 JAVA DRIVE · SUNNYVALE, CALIF.

CODE IDENT 28815

PL 10-129378

REV

KEY: * VENDOR ITEM · SEE SPECIFICATION CONTROL (OR SOURCE CONTROL) DWG.

CONTRACT NO.

SHEET

ITEM NO.	QTY / DASH NO.			CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	SPEC / MATERIAL OR REFERENCE DESIGNATION	KEY
			-1					
			REF	28815	50-131180	WIRING DIAGRAM		
1			1	09922	L22TF96P4N1	CONNECTOR	A2J1	
2			4	09922	LRMXSK-1	CONTACT		
3			4	AMERICAN	2031-7141	CONNECTOR RF (SMA)		
4			A/R	81349	RG142B/U	CABLE, RF		
5			A/R	06090	PVC ½	HEATSHRINK TUBING		
6			A/R	59730	WTW 1334	CABLE MARKER		

		CODE IDENT 28616	PL 10-13178
KEY: ▼ VERSION ITEM. SEE INTERCHANGEABILITY CHARTS FOR SOURCE CONTROLLING.		CONTRACT NO.	SHEET

ITEM NO.	QTY	DASH NO. -1			CODE IDENT	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTION	SPEC / MATERIAL OR REFERENCE DESIGNATION	REF
1		1			09922	12-12178-2	CONNECTOR	AS22	
2		4			00614	SMKVP-1	CONTACT		
3		4			80063	7031-1181	CONNECTOR RE (DUAL)		
4		A/R			81349	M81156/4	CABLE, CE		
5		A/R			00000	TWC 3	REFERENCE TUBING		
6		A/R			59730	MCW 1373	CABLE MARKER		

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41

RECORD OF REVISION STATUS OF EACH SHEET

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES

DECIMALS	ANGLES
2 PLACE ±	±
3 PLACE ±	

CONTRACT NO.

PREP RLS DATE 7-7-76

CHK

APPD QA

APPD K M Rund - 7-7-76

APPD

ESL INCORPORATED · 495 JAVA DRIVE · SUNNYVALE, CALIF.

TITLE

CABLE ASSY

SIZE	CODE IDENT NO.	DWG NO.
	28815	10-129380

SCALE	REV	SHEET
		1 of 2

FORM 394

ESL INCORPORATED · 495 JAVA DRIVE · SUNNYVALE, CALIF.	CODE IDENT 28815	PL 10-129380	REV
KEY: * VENDOR ITEM - SEE SPECIFICATION CONTROL (OR SOURCE CONTROL) DWG.		CONTRACT NO.	SHEET

ITEM NO.	QTY / DASH NO.			CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	SPEC / MATERIAL OR REFERENCE DESIGNATION	KEY
			-1					
					50-131180	WIRING DIAGRAM		
1			1		DBM25S	CONNECTOR	P6	
2			1		MS3122E22-55SW	CONNECTOR	J13	
3			1		MS3122E20-41P	CONNECTOR	J15	
4			3		13925	CONNECTOR	J5, J6, J7	
5			A/R	28815	58-119841-56	24 AWG TWISTED WIRE		
6			A/R	28815	58-119841-0	24 AWG BLK WIRE		
7			A/R	28815	58-119841-9	24 AWG WHT WIRE		
8			A/R	28815	EXE-24-19/36-SITW	24 AWG SCS		
9				59730	WTW-1224	CABLE MARKER		
10				06090	3/8 PVC	HEAT SHRINK TUBING		

REVISIONS

LTR	DESCRIPTION	DATE	APPROVED

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41

RECORD OF REVISION STATUS OF EACH SHEET

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES

DECIMALS	ANGLES
2 PLACE ±	±
3 PLACE ±	

CONTRACT NO.

PREP R STROOPE DATE 7/76

CHK

APPD QA

APPD W McBride 7-7-76

APPD

ESL INCORPORATED · 495 JAVA DRIVE · SUNNYVALE, CALIF.

TITLE

CABLE ASSY

SIZE	CODE IDENT NO.	DWG NO.
	28815	10-129386

SCALE	REV	SHEET
		1 of 2

FORM 394

ESL INCORPORATED · 495 JAVA DRIVE · SUNNYVALE, CALIF.

CODE IDENT 28815

PL 10-129386

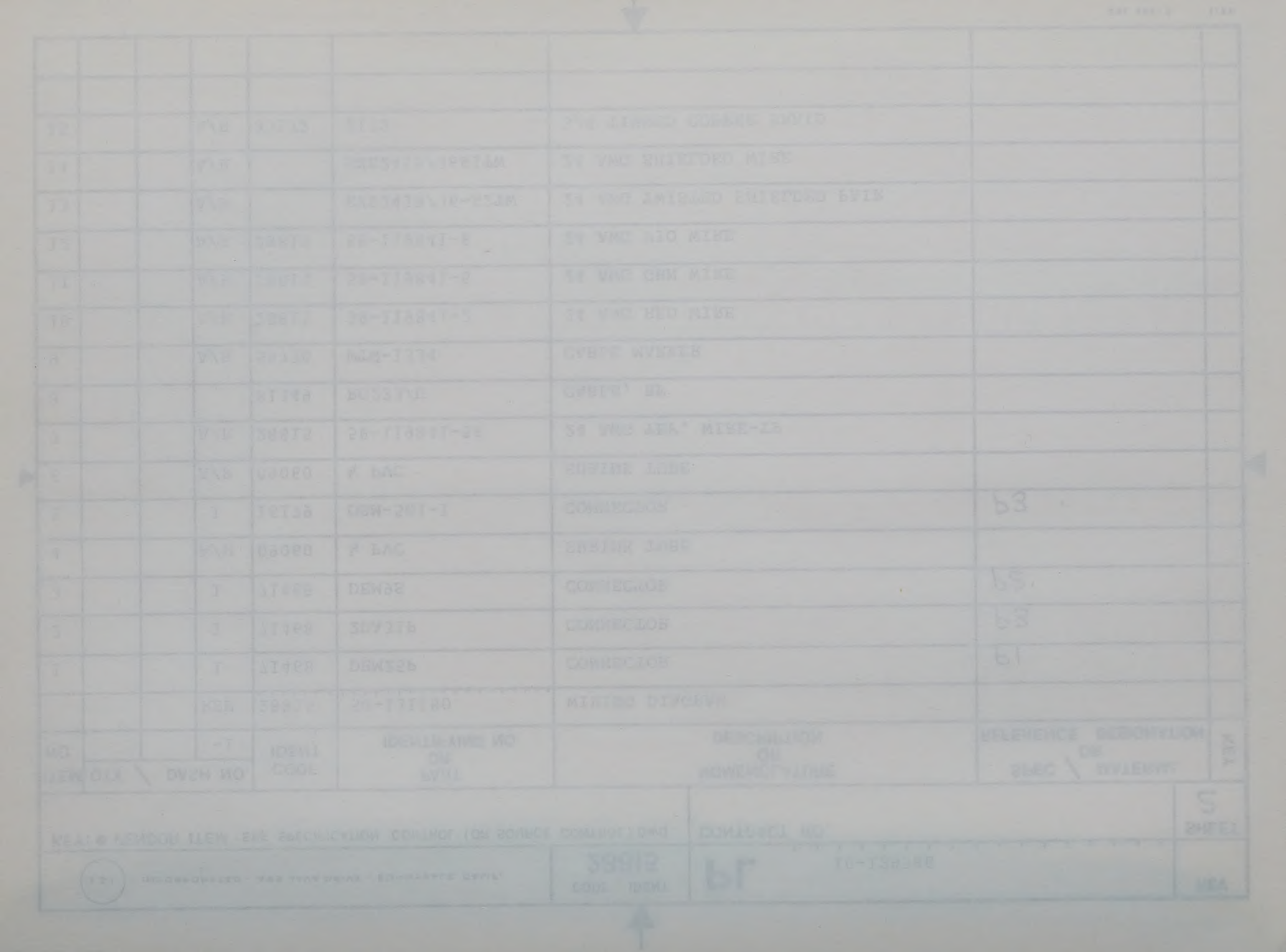
REV

KEY: * VENDOR ITEM - SEE SPECIFICATION CONTROL (OR SOURCE CONTROL) DWG.

CONTRACT NO.

SHEET 2

ITEM NO.	QTY / DASH NO.		-1	CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	SPEC / MATERIAL OR REFERENCE DESIGNATION	KEY
			REF	28815	50-131180	WIRING DIAGRAM		
1			1	71468	DBM25P	CONNECTOR	P1	
2			1	71468	2DA31P	CONNECTOR	P3	
3			1	71468	DEM9S	CONNECTOR	P2	
4			A/R	09060	½ PVC	SHRINK TUBE		
5			1	16179	OSM-501-1	CONNECTOR	P3	
6			A/R	09060	¼ PVC	SHRINK TUBE		
7			A/R	28815	58-119841-56	24 AWG TEF, WIRE-TP		
8				81349	RG223/U	CABLE, RF		
9			A/R	59730	WTW-1334	CABLE MARKER		
10			A/R	28815	58-119841-2	24 AWG RED WIRE		
11			A/R	28815	58-119841-5	24 AWG GRN WIRE		
12			A/R	28815	58-119841-8	24 AWG VIO WIRE		
13			A/R		EXE2419/36-S2TW	24 AWG TWISTED SHIELDED PAIR		
14			A/R		EXE2419/36S1TW	24 AWG SHIELDED WIRE		
15			A/R	23172	2172	3/8 TINNED COPPER BRAID		



REVISIONS

LTR	DESCRIPTION	DATE	APPROVED
A	Initial Release	5-10-76	[illegible]

QTY/DASH NO. -0	QTY/DASH NO. -1	ITEM NO.	CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	REFERENCE DESIGNATION	ITEM NO.
REFER			28815	10-129388	WIRING DIAGRAM		1
1	1						2
1	1		16179	0960-01-1	CONNECTOR, RF		3
1	1		80477	8282 2/4	" " "		4
24	AR		81349	M22759/11	CABLE, RF		5
12	AR		80009	PVC 1/2	BAND MARKER (SHRINK TUBING)		6

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41

RECORD OF REVISION STATUS OF EACH SHEET

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES

DECIMALS	ANGLES
2 PLACE ±	±
3 PLACE ±	

CONTRACT NO.

PREP K. BISSELL DATE 4-15-76

CHK

APPD QA

APPD [signature] 5/10/76

APPD

ESL INCORPORATED · 495 JAVA DRIVE · SUNNYVALE, CALIF.

TITLE: CABLE ASSY RF - W8

SIZE	CODE IDENT NO.	DWG NO.
	28815	10-129388

SCALE | REV | SHEET 1 OF 2

FORM 394

NOTES:

W8.

QTY/ DASH NO. -2	QTY/ DASH NO. -1	KEY	CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	REFERENCE DESIGNATION	ITEM NO.
REF	REF		28815	50-131180	WIRING DIAGRAM		1
							2
							3
1	1		16179	OSM501-1	CONNECTOR, RF		4
1	1		80058	UG88 E/U	" "		5
A/R	AR		81349	RG223/U	CABLE, IF		6
A/R	AR		06090	PVC 1/2	BAND MARKER (SHRINK TUBING)		7

ESI INCORPORATED

KEY: * - VENDOR ITEM - SEE SPECIFICATION CONTROL OR SOURCE CONTROL DRAWING
F - FEET I - INCHES B - BULK
AR - AS REQUIRED N - SEE NOTES

PL 10-129388

CODE IDENT 28815 | SHEET 2 OF 2 | REV

REVISIONS

LTR	DESCRIPTION	DATE	APPROVED
A	INITIAL RELEASE	5/10/76	[illegible]

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41

RECORD OF REVISION STATUS OF EACH SHEET

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES
DECIMALS ANGLES
2 PLACE ± ±
3 PLACE ±

CONTRACT NO.

PREP K. BISSELL DATE 4-15-76
CHK
APPD QA
APPD [illegible] 5-10-76
APPD

ESL INCORPORATED · 495 JAVA DRIVE · SUNNYVALE, CALIF.

TITLE CABLE ASSY RF - [illegible]

SIZE | CODE IDENT NO. 28815 | DWG NO. 10-129389

SCALE | REV | SHEET 1 OF 2

FORM 394

NOTES:

W9

QTY/DASH NO. -1	KEY	CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	REFERENCE DESIGNATION	ITEM NO.
REF		28815	50-131180	WIRING DIAGRAM		1
						2
						3
2		16179	OSM501-1	CONNECTOR		4
						5
AR		81349	RG223/U	CABLE, RF		6
AR		06090	PVC 1/2	BAND MARKER (SHRINK TUBING)		7

ESL INCORPORATED

KEY: * - VENDOR ITEM - SEE SPECIFICATION CONTROL OR SOURCE CONTROL DRAWING
F - FEET I - INCHES B - BULK
AR - AS REQUIRED N - SEE NOTES

PL 10-129389

CODE IDENT 28815 | SHEET 2 of 2 | REV

APPENDIX D

Cable Assembly
Parts List

10-130916
10-130909
10-130907
10-130908
10-130918
10-129377
10-130919
10-130917

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41

RECORD OF REVISION STATUS OF EACH SHEET

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES

DECIMALS	ANGLES
2 PLACE ±	±
3 PLACE ±	

CONTRACT NO.

PREP G. Bertucelli DATE 7-6-76

CHK

APPD QA

APPD W M Rivet 7-7-76

APPD

ESI INCORPORATED · 495 JAVA DRIVE · SUNNYVALE, CALIF.

TITLE

CABLE ASSY, RF 80 FT.

SIZE	CODE IDENT NO.	DWG NO.
	28815	10-129377

SCALE	REV	SHEET
		1 of 2

FORM 394

ESL INCORPORATED · 495 JAVA DRIVE · SUNNYVALE, CALIF.

CODE IDENT 28815

PL 10-129377

REV

KEY: * VENDOR ITEM - SEE SPECIFICATION CONTROL (OR SOURCE CONTROL) DWG.

CONTRACT NO.

SHEET

ITEM NO.	QTY / DASH NO. -1	CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	SPEC / MATERIAL OR REFERENCE DESIGNATION	KEY
1						
2	REF	28815	50-128138	WIRING DIAGRAM		
3	REF	28815	50-131179	WIRING DIAGRAM		
4	1	09922	L22TF96P6N1	CONNECTOR	A1 P1	
5	1	09922	L22TF96S6N1	CONNECTOR	A2 P1	
6	4	09922	LRMXSK-1	CONTACT		
7	4	09922	LRCXSK-1	CONTACT		
8						
9	A/R	81349	RG142B/U	CABLE, RF		
10	A/R	28815	12-137348	MARKER BAND (SHRINK TUBING)		

ESL INCORPORATED • 495 JAVA DRIVE • SUNNYVALE, CALIF.

PL 10-130907		A
CODE IDENT 28813	SHEET 1 OF 2	REV

CONTR NO	PREP R STROOPE DATE 9-2-76	CABLE ASSY
PROJECT NUMBER 1995	CHK 9-2-76	
	APPD 9-2-76	
	APPD [illegible] 9/10/76	

SYM	REVISION DESCRIPTION	DATE	APPROVED	SYM	REVISION DESCRIPTION	DATE	APPROVED

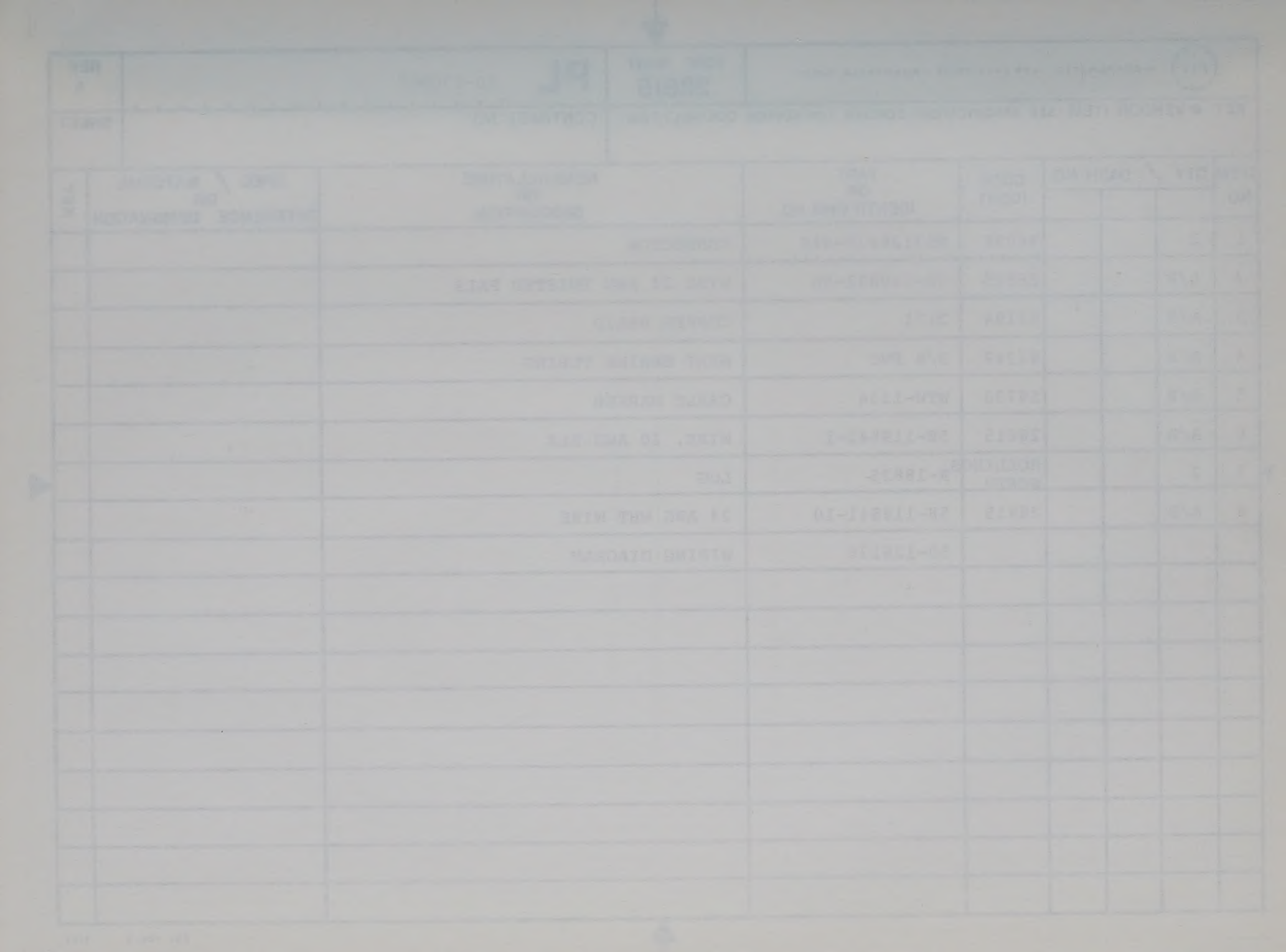
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42

RECORD OF REVISION STATUS OF EACH SHEET

	MODEL	PL 10-130907

ESL INCORPORATED · 495 JAVA DRIVE · SUNNYVALE, CALIF.	CODE IDENT 28815	PL 10-130907	REV A
KEY: * VENDOR ITEM · SEE SPECIFICATION CONTROL (OR SOURCE CONTROL) DWG.		CONTRACT NO.	SHEET

ITEM NO.	QTY	DASH NO.		CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	SPEC / MATERIAL OR REFERENCE DESIGNATION	KEY
1	2			96096	MS3126F20-41S	CONNECTOR		
2	A/R			28815	58-119841-56	WIRE 24 AWG TWISTED PAIR		
3	A/R			92194	2171	COPPER BRAID		
4	A/R			81349	3/8 PVC	HEAT SHRINK TUBING		
5	A/R			59730	WTW-1334	CABLE MARKER		
6	A/R			28815	58-119842-1	WIRE, 20 AWG BLK		
7	2			HOLLINGSWORTH	R-18825	LUG		
8	A/R			28815	58-119841-10	24 AWG WHT WIRE		
					50-128138	WIRING DIAGRAM		



ESL INCORPORATED • 495 JAVA DRIVE • SUNNYVALE, CALIF.

PL 10-130908 | REV A

CODE IDENT 28315 | SHEET 1 OF 2 | REV

CONTR NO	PREP [illegible]	DATE 5-2-74
PROJECT NUMBER	CHK [illegible]	10/74
1995	APPD [illegible]	11/74
	APPD R. McRae	7/11/77

CABLE ASSY

SYM	REVISION DESCRIPTION	DATE	APPROVED	SYM	REVISION DESCRIPTION	DATE	APPROVED

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42

RECORD OF REVISION STATUS OF EACH SHEET

MODEL

PL 10-130908

ESL INCORPORATED · 495 JAVA DRIVE · SUNNYVALE, CALIF.

CODE IDENT	PL	REV
28815	10-130908	A

KEY: * VENDOR ITEM - SEE SPECIFICATION CONTROL (OR SOURCE CONTROL) DWG. | CONTRACT NO. | SHEET

ITEM NO.	QTY	DASH NO.		CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	SPEC / MATERIAL OR REFERENCE DESIGNATION	KEY
1	1			96096	MS3126F16-8S	CONNECTOR		
2	1			96096	MS3126F16-8P	CONNECTOR		
3	A/R			28815	58-119843-10	16 AWG WIRE, WHT		
4	A/R			28815	58-119842-1	20 AWG WIRE, BLK		
5	A/R			92194	2171	¼ COPPER BRAID		
6	A/R			81349	3/8 PVC	HEAT SHRINK TUBING		
7	2			HOLLINGS WORTH	R18825	LUG		
8	A/R			59730	WTW-1334	CABLE MARKER		
					50-128138	WIRING DIAGRAM		
					50-131179	WIRING DIAGRAM		

ESL INCORPORATED • 495 JAVA DRIVE • SUNNYVALE, CALIF.

PL 10-130909		A
CODE IDENT 28015	SHEET 1 OF	REV

CONTR NO	PREP [illegible] DATE 9-7	CABLE ASSY
PROJECT NUMBER 1919	CHK	
	APPD	
	APPD R. McRae 9/11/77	

SYM	REVISION DESCRIPTION	DATE	APPROVED	SYM	REVISION DESCRIPTION	DATE	APPROVED

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42

RECORD OF REVISION STATUS OF EACH SHEET

	MODEL	PL 10-130909

ESL INCORPORATED · 495 JAVA DRIVE · SUNNYVALE, CALIF.

CODE IDENT	PL	REV
28815	10-130909	A

KEY: * VENDOR ITEM - SEE SPECIFICATION CONTROL (OR SOURCE CONTROL) DWG. | CONTRACT NO. | SHEET

ITEM NO.	QTY	DASH NO.		CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	SPEC / MATERIAL OR REFERENCE DESIGNATION	KEY
1	2			96906	MS3126F14-15S	CONNECTOR		
2	A/R			28815	58-119841-10	24 AWG WIRE, WHT		
3	A/R			28815	58-119842-1	20 AWG WIRE, BLK		
4	A/R			28815	58-119841-56	24 AWG TWISTED PAIR		
5	A/R			92194	2171	¼ COPPER BRAID		
6	A/R			81349	3/8 PVC	HEAT SHRINK TUBING		
7	2			59730	WTW-1334	CABLE MARKER		
8	2			HOLLINGSWORTH	R18825	LUG		
						CABLE ASSY		
					50-128138	WIRING DIAGRAM		

INCORPORATED • 495 JAVA DRIVE • SUNNYVALE, CALIF.

	10-130916	A
	CODE IDENT 28015	SHEET 1 OF 2

CONTR NO	PREP DATE	CABLE ASSY
PROJECT NUMBER	CHK	
1995	APPD	
	APPD	

SYM	REVISION DESCRIPTION	DATE	APPROVED	SYM	REVISION DESCRIPTION	DATE	APPROVED

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42

RECORD OF REVISION STATUS OF EACH SHEET

	MODEL	10-130916

ESL INCORPORATED · 495 JAVA DRIVE · SUNNYVALE, CALIF.	CODE IDENT 28815	PL 10-130916	REV A
KEY: * VENDOR ITEM - SEE SPECIFICATION CONTROL (OR SOURCE CONTROL) DWG.		CONTRACT NO.	SHEET

ITEM NO.	QTY / DASH NO.			CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	SPEC / MATERIAL OR REFERENCE DESIGNATION	KEY
1	1			96906	MS3126F22-55PW	CONNECTOR		
2	1			96906	MS3126F14-19P	CONNECTOR		
3	A/R			28815	58-119841-56	24 AWG TWISTED PAIR		
4	A/R			28815	58-119842-1	20 AWG WIRE, BLK		
5	A/R			92194	2171	COPPER BRAID		
6	A/R			81349	3/8 PVC	HEAT SHRINK TUBING		
7	2			59730	WTW-1334	CABLE MARKER		
8	2			HOLLINGS WORTH	R11825	LUG		
					50-128138	WIRING DIAGRAM		

| | | |

ESL INCORPORATED · 495 JAVA DRIVE · SUNNYVALE, CALIF.

PL 10-130917 | A

CODE IDENT 29815 | SHEET 1 OF 2 | REV

CONTR NO	PREP	DATE
PROJECT NUMBER	CHK	
1995	APPD	
	APPD	

CABLE ASSY

SYM	REVISION DESCRIPTION	DATE	APPROVED	SYM	REVISION DESCRIPTION	DATE	APPROVED

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42

RECORD OF REVISION STATUS OF EACH SHEET

MODEL

PL 10-130917

ESL INCORPORATED · 495 JAVA DRIVE · SUNNYVALE, CALIF.

CODE IDENT	PL	REV
28815	10-130917	A

KEY: * VENDOR ITEM · SEE SPECIFICATION CONTROL (OR SOURCE CONTROL) DWG. | CONTRACT NO. | SHEET

ITEM NO.	QTY	DASH NO.		CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	SPEC / MATERIAL OR REFERENCE DESIGNATION	KEY
	2			96906	MS3126F22-55PW	CONNECTOR		
	A/R			28815	58-119841-56	24 AWG TWISTED WIRE		
	A/R				RG-223	COAX		
	A/R			92194	2171	COPPER BRAID		
	A/R			81349	3/8 PVC	HEAT SHRINK TUBING		
	2			59730	WTW-1334	CABLE MARKER		
	2			HOLLINGS WORTH	R-18825	LUG		
	A/R			28815	58-119842-1	20 AWG WIRE, BLK		
	1					CONNECTOR		
					50-131179	WIRING DIAGRAM		

ESL INCORPORATED • 495 JAVA DRIVE • SUNNYVALE, CALIF.

PL 10-130918		A
CODE IDENT 28815	SHEET 1 OF	REV

CONTR NO	PREP DATE 8-11
PROJECT NUMBER	CHK
	APPD
1995	APPD 7/11/77

CABLE ASSY

SYM	REVISION DESCRIPTION	DATE	APPROVED	SYM	REVISION DESCRIPTION	DATE	APPROVED

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42

RECORD OF REVISION STATUS OF EACH SHEET

	MODEL	10-130918

ESL INCORPORATED · 495 JAVA DRIVE · SUNNYVALE, CALIF.

CODE IDENT 28815

PL 10-130918

REV A

KEY: * VENDOR ITEM - SEE SPECIFICATION CONTROL (OR SOURCE CONTROL) DWG.

CONTRACT NO.

SHEET

ITEM NO.	QTY / DASH NO.			CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	SPEC / MATERIAL OR REFERENCE DESIGNATION	KEY
1	1			96906	MS3126F12-10P	CONNECTOR		
2	A/R				RG223	COAX CABLE		
3	2			59730	WTW-1334	CABLE MARKER		
4					6001	CONNECTOR		
5					50-128138	WIRING DIAGRAM		

| | | |

INCORPORATED • 495 JAVA DRIVE • SUNNYVALE, CALIF.

	10-130919	A
CODE IDENT 28813	SHEET 1 OF 2	REV

CONTR NO	PREP DATE	
PROJECT NUMBER	CHK	CABLE ASSY
1995	APPD	
	APPD M McBride 7/11/77	

SYM	REVISION DESCRIPTION	DATE	APPROVED	SYM	REVISION DESCRIPTION	DATE	APPROVED

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42

RECORD OF REVISION STATUS OF EACH SHEET

	MODEL	10-130919

ESL INCORPORATED · 495 JAVA DRIVE · SUNNYVALE, CALIF.	CODE IDENT 28815	PL 10-130919	REV A
KEY: * VENDOR ITEM · SEE SPECIFICATION CONTROL (OR SOURCE CONTROL) DWG.		CONTRACT NO.	SHEET

ITEM NO.	QTY / DASH NO.			CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	SPEC / MATERIAL OR REFERENCE DESIGNATION	KEY
1	1			96906	MS3126F12-3S	CONNECTOR		
2	A/R			BELDEN	17238-5	PWR CORD		
3	1			59730	WTW-1334	CABLE MARKER		
					50-128138	WIRING DIAGRAM		

ITEM NO	QTY / DWG NO	IDENT CODE	IDENTIFYING NO OR NOMENCLATURE	DESCRIPTION	REFERENCE DESIGNATION OR SYSEC / ATTACHMENT
1	1	80009	20-778578	MOUNTING STRUCTURE	
2	1	80009	6J4-1178	CIRCUIT BREAKER	
3	AR	80009	MS35206-22	SCREW	
4	2	80009	MS35207-262	CLAMP,CABLE	

KEY & WINDOW USER SEE INSTRUCTION DYNAMIC FOR SPACE ORIENTATION

SIZE B7 CONTROL NO 70-778578

SHEET 1 OF 1